86TH CONGRESS
1st Session

SENATE

DOCUMENT
No. 9

FULL USE AND DEVELOPMENT OF MONTANA'S TIMBER RESOURCES

A SURVEY

PREPARED FOR

THE MONTANA DELEGATION

RELATING TO

DEVELOPING THE POTENTIAL OF FOREST RESOURCES IN MONTANA

PRESENTED BY MR. MURRAY

JANUARY 27, 1959.—Ordered to be printed with illustrations

UNITED STATES
GOVERNMENT PRINTING OFFICE
WASHINGTON : 1959

35555

[Excerpt from Congressional Record of January 27, 1959]

Mr. MURRAY. Mr. President, I ask unanimous consent to print as a Senate document, with illustrations, a survey compiled by the Forest Service, Department of Agriculture, entitled "Full Use and Development of Montana's Timber Resources."

The PRESIDING OFFICER. Is there objection to the request of the gentleman from Montana?

The Chair hears none. Without objection, it is so ordered.

CONTENTS

EXPLANATION OF ABBREVIATIONS AND UNITS OF MEASURE USED IN TEXT

M b.m. = Thousand feet, board measure.
d.b.h. = Tree diameter in inches, outside bark, measured 4½ feet above average ground level.
M = Thousand.
MM = Million.

SYMBOLIC OF THE INDUSTRY IS THE WHITE HOUSE 1958 CHRISTMAS TREE—A 74-FOOT MONTANA SPRUCE

"Christmas tree production from Montana leads the Nation. Even so, plants for processing Christmas trees and ornaments have more possibilities than are presently realized" (p. 4).

FOREWORD

The economic strength of America rests upon our people as individuals and as a part of our democratic government, meeting the challenge posed by changing conditions. Basic to harnessing our capabilities to develop the coordinated teamwork needed to provide progress are facts and a definition of the opportunities available. Public and private enterprise must then meet its obligations.

On July 31, 1958, the Montana delegation, with its customary cooperation, joined together to ask the U.S. Forest Service headquarters in Montana to prepare a study outlining a statewide program needed to fully develop the potential of Montana's forest resources. We sought a program that would encompass Federal, State, and private responsibilities. We selected the U.S. Forest Service to prepare this initial report because it is the major land and timber holder in Montana.

This is a grassroots report, embracing on a statewide basis the concept set forth by the President's Committee for Rural Development Program. There are now two pilot rural development programs going forward in Montana, one in Lake and the other in Ravalli County. This report sets the stage to bring together all of the people of Montana in a coordinated effort to advance our State's welfare through promoting sound forest resource development. This is an approach which can be productively applied to our other great resources.

In 1957, there were 8,000 man-years representing nearly $40 million in wages in primary timber production in Montana. Secondary manufacturing of timber products produced 1,600 man-years of employment, representing more than $8 million in wages. In that same year there were nearly 1,100 private, State, and Federal foresters and their employees with wages amounting to nearly $7 million managing Montana's timber resource for a total of 10,600 man-years and $56 million in wages.

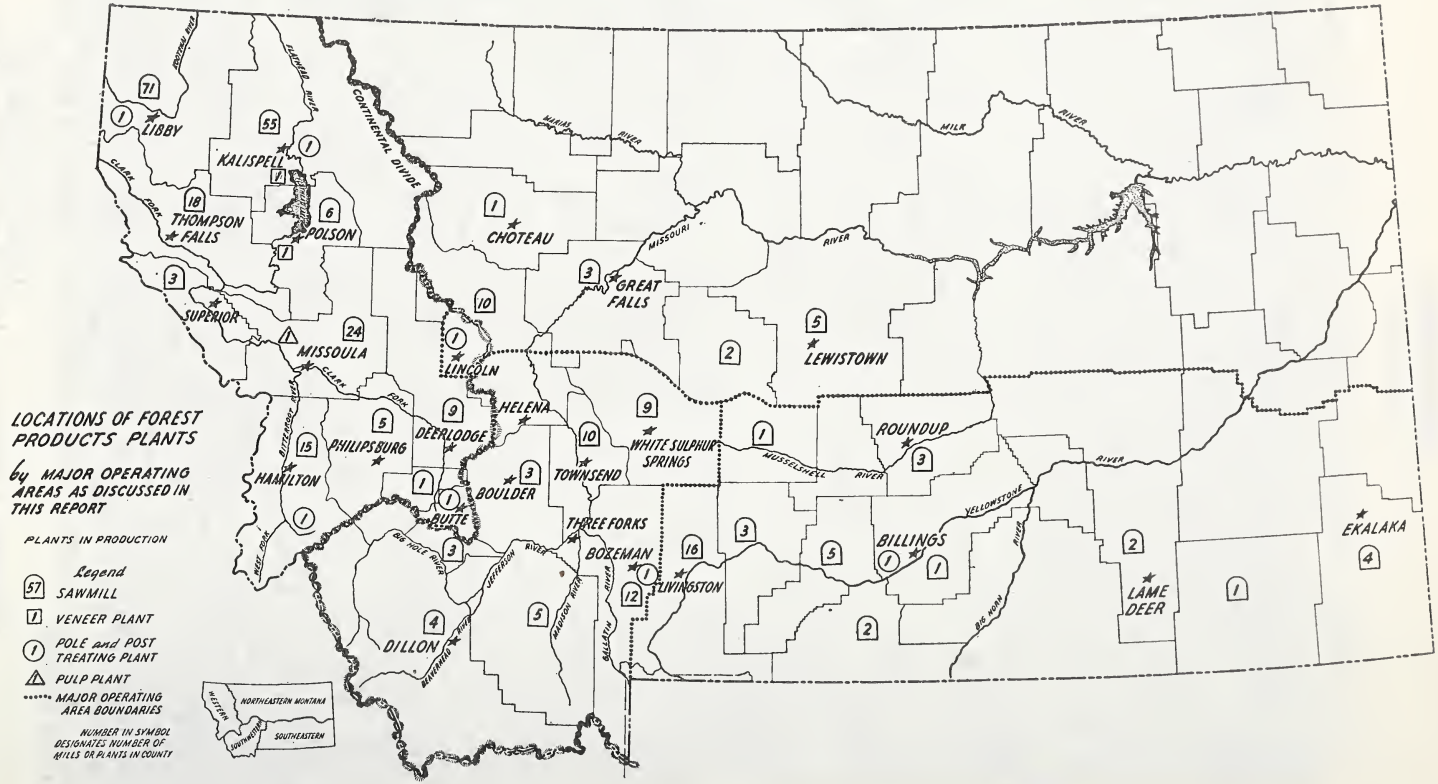
Projection of Montana forest development on the basis of sustainable levels would result in primary production employment of 24,000 man-years and $120 million in wages, increases of almost 300 percent. Likewise full development would increase secondary manufacturing of timber products almost eightfold for a total of 14,000 man-years and $80 million in payroll. There would of course be a need for most foresters and other employees.

Thus full use and development of Montana's timber resources would provide a total of 43,000 man-years of employment and $230 million in wages, according to Forest Service estimates.

Because this report is of such signal interest, I felt that it should be printed as a Senate document. It is a pattern for Montana and its central thesis can and should be an inspiration to our people and to those in the other States of our great Union.

This report was made possible by the leadership of Senator Mike Mansfield, Congressmen Lee Metcalf and LeRoy Anderson; the cooperation of many officials in Montana's State and local government, numerous citizens and the constructive response of U.S. Forest Service officials.

JAMES E. MURRAY,
Chairman, Committee on Interior and Insular Affairs.


LOCATIONS OF FOREST PRODUCTS PLANTS
by MAJOR OPERATING AREAS AS DISCUSSED IN THIS REPORT
PLANTS IN PRODUCTION
Legend
57 SAWMILL
1 VENEER PLANT
(1) POLE and POST TREATING PLANT
⚠ PULP PLANT
MAJOR OPERATING AREA BOUNDARIES
NUMBER IN SYMBOL DESIGNATES NUMBER OF MILLS OR PLANTS IN COUNTY
NORTHEASTERN MONTANA
SOUTHEASTERN
WESTERN
SOUTHWESTERN
LIBBY
KALISPELL
THOMPSON FALLS
POLSON
SUPERIOR
MISSOULA
CHOTEAU
GREAT FALLS
LEWISTOWN
LINCOLN
HELENA
DEERLODGE
PHILIPSBURG
HAMILTON
BUTTE
BOULDER
TOWNSEND
WHITE SULPHUR SPRINGS
ROUNDUP
THREE FORKS
BOZEMAN
LIVINGSTON
BILLINGS
DILLON
LAME DEER
EKALAKA
CONTINENTAL DIVIDE
MISSOURI RIVER
MILK RIVER
CLARK FORK
BITTERROOT RIVER
MUSSELSHELL RIVER
YELLOWSTONE RIVER
BIG HOLE RIVER
JEFFERSON RIVER
MADISON RIVER
GALLATIN RIVER
BIG HORN RIVER

LETTER FROM MONTANA'S CONGRESSIONAL DELEGATION TO CHARLES TEBBE, REGIONAL FORESTER, U.S. FOREST SERVICE, REQUESTING A STUDY OF MONTANA'S FOREST POTENTIAL

U.S. SENATE,
COMMITTEE ON INTERIOR AND INSULAR AFFAIRS,
July 31, 1958.

Mr. CHARLES TEBBE,
Regional Forester, U.S. Forest Service, Missoula, Mont.

DEAR MR. TEBBE: On April 24, the northwestern Senators addressed a letter to Secretary of Agriculture Benson, seeking his views on the programs needed to assure reaching the national forestry goals set out in the "Timber Resources Review" by the year 2000. In his May 20 reply, Secretary Benson indicated that in the main, the necessary statutory authority was available and he left the impression with us that the major problem was financing the goals.

We have been giving serious study to the local action programs that are needed, and this letter is not only a request to you but also an assurance of warm interest and a pledge of assistance in providing leadership on matters within the legitimate province of the Federal Government.

We seek now a program for Montana which is designed to fully develop her forest resources for the longtime benefit of the State and Nation.

In 1952 the Forest Service issued a study on "Forest Resources in Montana" and this study, taken together with the 1958 "Timber Resources Review," forms a suitable factual base for the development of action programs.

The preeminence of the national forests in Montana creates a situation which makes it sound and wise for the Forest Service to exercise leadership in developing a statewide action program in concert with interested State and private organizations.

We should build now for the future by setting forth the goals sought, presenting the need for basic and practical research, and describing the economic development that will need to be implemented as well as the dollar cost and benefits to be obtained.

We specifically believe there is a need to consider for our forests at least the following points:

1. The type and location of plants needed to obtain maximum development.
2. Opportunities to expand secondary manufacturing.
3. Market potential within and beyond the State of Montana.
4. Recognition of supply problems that may affect existing plants.
5. Consideration of shifts in plant locations that may occur when the forest changes in complexion as it becomes managed.
6. Transportation needs for intrastate and interstate commerce, including the question of freight rates.
7. New products that can be developed from wood, including specialized machinery for manufacture.

8. Programs needed to secure forest roads, reforestation, timber sales forces to meet production goals by selected times.

The opportunities to develop recreation in Montana must be an integral part of any program. Special consideration should be given to ascertaining the type and amount of different recreational facilities needed to meet the desires of people. The study should strive to ascertain what brings people to Montana for recreation, what will bring more people to the Treasure State, and what are the recreational preferences of our own residents. This study can go forward under the Outdoor Recreation Resources Review Commission.

Water management is a most important objective in resource development and we would point out that forest development plans should recognize the need for assuring the timeliness, quantity and quality of waterflow. In addition, where dams or other work on rivers will affect the timber economy, full recognition should be given to needed adjustments.

There are some regional differences in Montana; therefore, in addition to the overall plan you develop, localized plans which will form the base for community action should be presented.

We desire that you apply your technical knowledge and your ingenuity to present to us the outline of the programs needed to accomplish the general goals we have set forth. Tentative estimates of costs should be made, schedules and priorities for placing various phases of the plan into operation should be suggested, and estimates of total benefits set forth and related to the cost of developing these benefits.

We fully recognize that the development of a local program presents some problems in assuring financing when weighed against demands from other areas. Montana would be an excellent State in which to start a program which could serve as a model for use in the other Western States. We are encouraged by the recent action of the Congress in providing $900,000 to construct a fire-research laboratory at Missoula. It could also be demonstrated that Montana is the logical place to create an action program for full forest development.

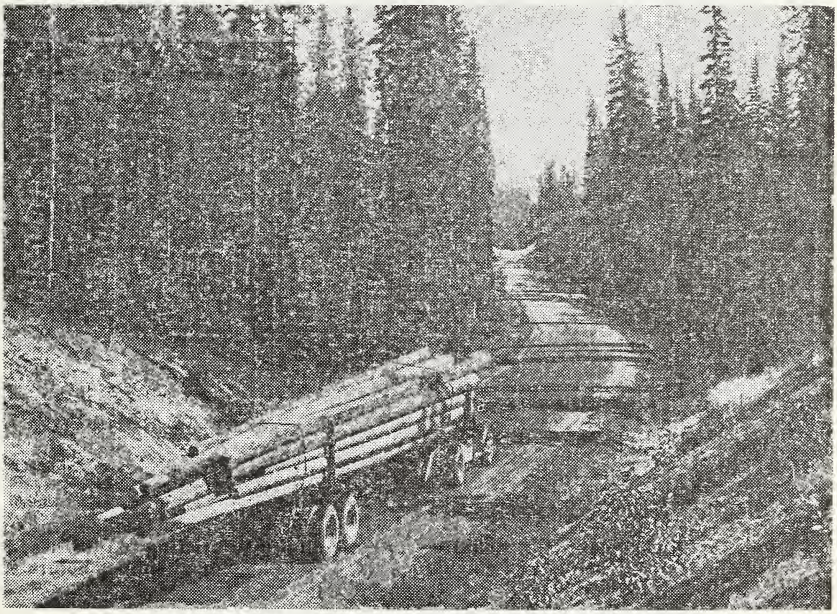
In this request we want it well understood that we are not seeking the views of your Washington headquarters, the Department, or the Budget Bureau on the necessity, feasibility, or desirability of what we suggest. Instead we seek an objective evaluation by the people on the ground of what must and should be done in order for Montana's forests to fulfill their proper role in helping develop and maintain a Nation's well-being.

We would like a full analysis and report by November 15, 1958. If you wish to advise or consult with us on any matter prior to that time, please feel free to do so. We now plan, upon receipt of your report, to discuss the matter further with the appropriate people to determine what steps should be taken to assure its implementation within a reasonable period.

Sincerely yours,

James E. Murray,
Mike Mansfield,
U.S. Senators.
Lee Metcalf,
LeRoy Anderson,
Members of Congress.

"The timber is here; good timber and plenty of it * * *" (p. 30)



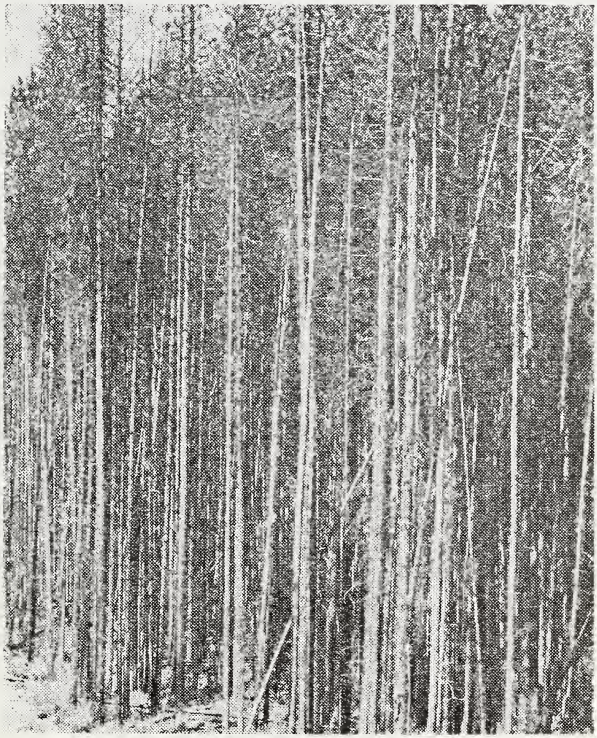
"There are 131 million cords of wood in trees between 5 and 11 inches d.b.h." (p. 5) and "The potential for increased pole production is very large" (p. 11)

35555—59——2

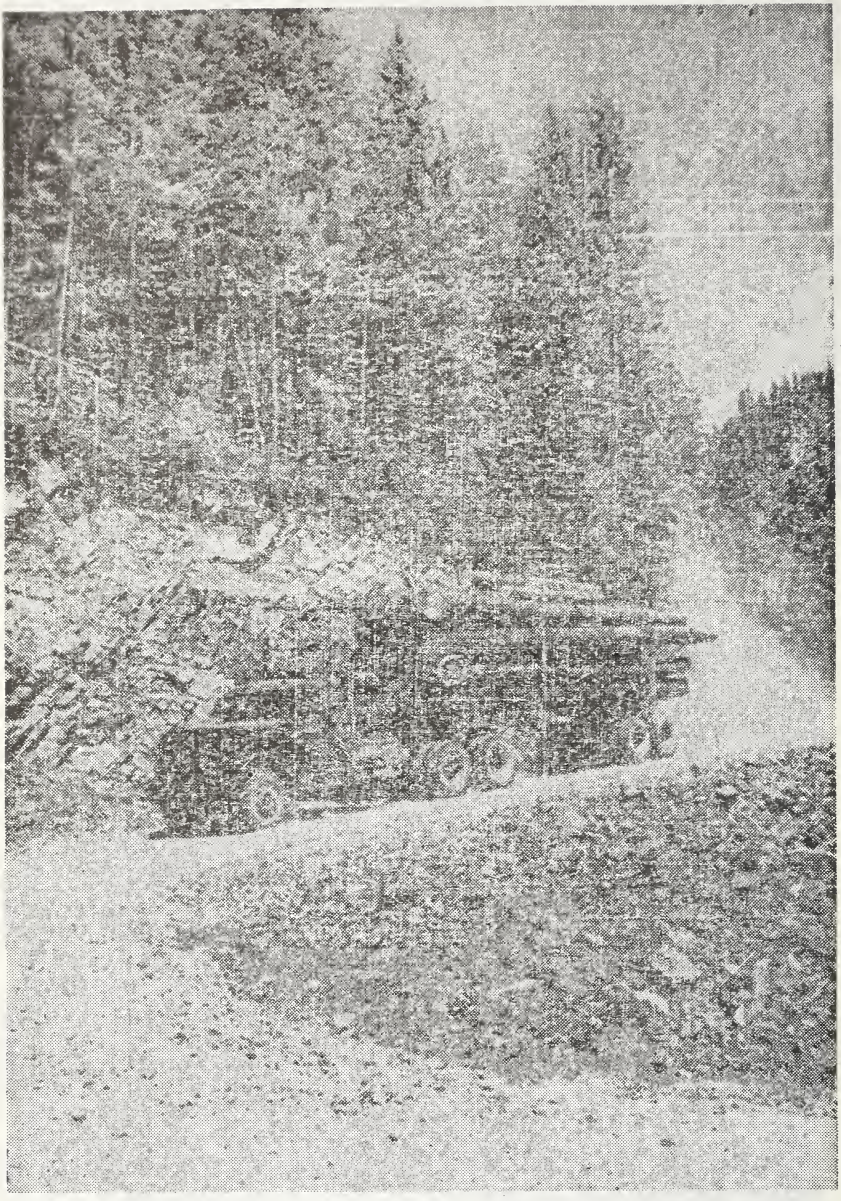
"Montana's vast reservoirs of pulpwood are as yet virtually untapped" (p. 3)

"A number of problems * * * definitely affect supplies to existing plants. The first of these is the problem of salvaging * * * available dead timber before it deteriorates" (p. 23)

"Idle lands do not contribute timber supplies * * *" (p. 24)



"A corollary to poor stocking is overstocking" (p. 24)



"Access by means of which to salvage heavy losses from fire, insects, disease and windthrow, and to bring overmature and decadent stands under management, will help greatly" (p. 7)

LETTER OF TRANSMITTAL FROM CHARLES TEBBE, REGIONAL FORESTER, U.S. FOREST SERVICE

U.S. Forest Service,
Missoula, Mont., December 31, 1958.

Hon. James E. Murray and Mike Mansfield,
U. S. Senate.
Hon. Lee Metcalf and LeRoy Anderson,
House of Representatives.

Dear Sirs: This is in response to your inquiry of July 31 concerning the situation and needs as they relate to full use and development of Montana's forest resources.

We have tried earnestly to give adequate though brief and readable answers to your general and specific questions. Much work was performed to bring up to date and present timber inventory and related data by four subdivisions of the State. Rough drafts of each section of the report have been reviewed by Montana citizens representative of forest industry, other industry, State planning agencies, the State forester's office, and the school of forestry. Discussions were held, and many helpful ideas and suggestions were offered that have been incorporated in the final draft. It is accurate to say that the report was read with great interest and received general endorsement of the consultants. Nevertheless, it is a Forest Service report, based on Forest Service data and analysis, primarily.

We call attention to the type and location of plants needed for full use and development of Montana's forest resource. The need for a variety of outlets is stressed; that is, veneer plants, pole-processing yards, and plants for production of pulp, fiberboard, chemical and other products in addition to sawmills. This means integration of facilities, either on a company or area basis or both, so the highest and best use may be made of the variable products of Montana forests.

In discussing the location of such plants, we have for each of four sections of the State presented the forest inventory, described its suitability for different uses, and given an indication of the number and kinds of wood-using plants now operating and those additional ones that can be sustained indefinitely. The overall picture and that for each portion of the State discussed is one of great, unrealized opportunity. Montana's forests are very extensive. In large part they are not served by roads, which is the principal reason this great resource remains on tap. But on tap it is, and on the threshold of development to supply the needs of the State and Nation.

More secondary manufacture is possible and needed for full use and development of the forest, which means additionally, the capture or exploitation within the State of maximum employment and income opportunities. Plants using boards rather than logs for raw material,

they are needed in a few places to offset the loss of employment that is expected to result from excess sawmill capacity. But elsewhere, and wherever they are, such plants turning out sash and doors, precut housing units, cabinets, furniture, etc., supply jobs in the ratio of 5 to 1 and higher, as compared with primary processing plants.

Market potentials within and beyond the State are bright. This has not always been so, but the prospective climb of wood needs in the United States, and the general requirements-supply situation augurs well for those sections of the country with large reserves of virgin timber.

You asked about supply problems that may affect existing plants in Montana, and the shifts in plant location that may occur. We have discussed these questions separately in the report, but they are related. Because of an excess of requirements over supply of the large-size quality timber that has traditionally been cut in a few places in western Montana, it is expected that some plants will be in supply difficulty. A very few closures have already occurred. However, what finally happens and to whom depends on a number of factors, such as the alertness of management to changing conditions, company resources, timber ownership, the development of access to timber, and perhaps more importantly, the extent to which there is willingness and ability to shift dependence to the sizes and species and quality of timber that is available. Such shifts could be made in place in some instances; in others a new plant location and new equipment designed for small-log utilization might be involved.

Other supply problems and their solution are of longer term and relate to forestry measures—whether and to what extent they are taken, and how soon. One of these is the salvage of dead timber—the capture of huge mortality losses, past and current. Pertinent to this is the question of access which is generally lacking, and suitable outlets which are insufficient in size and variety. The bringing of idle and poorly stocked lands into production through planting is another. This would have immediate as well as long-term effect on the availability of timber for use. See page 23 for the explanation. Huge areas of overstocked stands resulting from old fires need thinning and other cultural work to avoid stagnation.

We think you will find the section in interstate and intrastate transportation needs constructive, as well as our treatment of the freight-rate question. Full use and development, or realization of the potentials described for the State and its subdivisions, necessarily calls for full use and development of the national forests, because of the preponderance of national-forest-land and timber volumes. Full use and development of the national forests, so far as timber is concerned, calls for roads, primarily—more roads than generally realized.

Interstate roads to serve Montana's forest resource are considered inadequate but well on the way to adequacy under existing Federal aid highway programs.

A 1957 report by the Bureau of Public Roads show that at the current rate of progress about 23 years will be required to accomplish the more urgently needed portion of the State's *forest highway program.*

With respect to freight rates and their effect on full use and development of forest resources, the report undertakes to present that which appears obvious. We are laymen in this field, without benefit of full

knowledge of the inherent complexities of freight rate structures. We say simply that—

(*a*) Montana is far from population centers and markets—a distance which rail facilities and favorable rates can abridge.

(*b*) In part, because of this remoteness and cost to market, many timber-operating chances show low or nonexistent operating margins. Therefore, huge timber volumes that could be cut and need to be cut are not moving.

(*c*) We estimate the tonnage of long-haul freight that is currently moving and contrast this with the tonnage that could move, year after year, indefinitely, with full use and development of the timber resource. The difference is very large. No easy solutions to the rail-transportation problems of the railroads, the timber industries, the conservation agencies, or of the consuming public are likely to be found. Perhaps closer cooperation among interested groups and mutually developed understanding could produce greater headway toward common objectives. It is to be hoped that greater progress can be made.

A key to realizing the possibilities held out in the report is more effective use and development of the national forests. They embrace 60 percent of the total commercial forest area and 70 percent of the volume. (See p. 5.) A still higher proportion of the base for *expanded* production is in the national forests. In any program for full use and development of the timber resource of the national forests, the multiple-use principle of national forest management must not be lost sight of for that is the principle or policy that allows and insures the use of these great public properties by all interests and segments of the population.

In conclusion I would point out some non-national-forest aspects of full use and development that should have attention. The production goals reflect the inventory and productive capacity of State, other Federal, and private land. There are some large blocks in strong industrial holdings, but 78 percent of the private, or 3.8 million acres, are in farm and nonindustrial ownership; 2.8 million acres are in tracts smaller than 5,000 acres. Some lands in these categories are better managed than others. The sustainable-production estimates presuppose care and management of other lands at least equal to or better than that on the national forests, and built into the estimates of national-forest yield is an intensity of management better than now exists. This is a fact which calls for a purposeful forestry effort on other lands.

Sincerely yours,

CHAS. L. TEBBE,
Regional Forester.

THE TYPE AND LOCATION OF PLANTS NEEDED TO OBTAIN MAXIMUM DEVELOPMENT OF MONTANA'S FOREST RESOURCES

TYPES OF PLANTS

Probably no other industry has and must contend with such variety in its basic raw material as does the wood-products industry. In Montana, particularly, the forest produces trees of 12 softwood timber species, each with its own characteristics. Within each species individual trees run the whole gamut of size and quality classes. Some are ideally suited to certain uses, others are not, though fortunately for operators, there is variety too in the uses to which wood is put, and most processors most of the time have managed to dispose of most of the timber they cut and removed from the woods.

However, 95 percent of the timber cut in Montana is made into lumber and dimension, and every sawmill is plagued at one time or another by overproduction of the lower grades and less valuable species. All too frequently disposal entails costs and losses that make operation hazardous, to say the least. Where there has been a choice to do so, large components of the stand have been left uncut. Sometimes this has turned out to be "storage on the stump" until better markets developed. In other instances it has meant high grading the stand, exorbitant woods waste, costly clearing of the ground, and delayed reproduction of desirable species. Additionally, in Montana, exercise of choice, by sawmills, of what timber they shall cut, has resulted in no cutting at all, to speak of, in huge areas of the State supporting huge volumes of timber, predominately of the smaller-size classes.

It it clear that full use and development of Montana's forest resources is contingent upon there being a variety of outlets, so the varied product of the forest can be shunted to that plant which is designed to process it most efficiently and to prepare it for that use to which it is best suited and of highest value. The sawmill which has pioneered here, which has made incalculable contributions to the economy of Montana, and which has strained to develop and use one of the State's greatest resources, is simply not the medium on which the whole burden of development and use can or should be placed.

A variety of outlets for a variable raw material is a layman's expression meaning industrial integration.—Industry does not necessarily have to be big to be integrated, although there are in the State some good examples of larger companies which are diversifying their plants and products to better use what the forest grows. Otherwise there can be integration on a community or area basis, wherein a sawmill owned

35555—59——3

by one company, a veneer plant by another, a pulpmill, pole, fiberboard, chemical, or other plant by others, provide the needed variety of outlets. There are examples of this kind of integration too in the State, of which Missoula with its sawmills for big and small logs, pulpmill and lumber remanufacturing plants, etc., is perhaps the fastest developing, but with opportunities yet to be exploited.

So much for the types of plants needed for full development and use of the forest resource. All are needed that can process trees and logs—round wood. Plants that use boards rather than logs for raw material—in other words, secondary manufacturing plants—are needed too but they are to be the subject of a later discussion.

The location of needed plants is a matter requiring the utmost of economic analysis and seasoned judgment.—To be sure, when the time comes, these will be brought to bear by others than the authors of this report, and it would be futile and uncalled for to undertake to name places and thus suggest allocation of resources. Rather, we are in a better position to present, for different portions of the State, a picture of the volume and character of the resource available; something of its suitability for different uses and types of plants; discuss the present use; and give an indication of size and variety of wood-using plants that could be sustained. Some of these plants, if built, would quite naturally tend to be located at existing centers of manufacture. Others may properly be located elsewhere to capture a particular transportation or other advantage.

The practice of purchasing, exchange, and distribution of logs by species, size, and quality classes, which is a prerequisite to integration on an area basis, is already well established in forest-products industry.—If the timber is available, whether publicly or privately owned, rail facilities plus good roads and modern trucks facilitate its movement and distribution. In contrast to earlier years, it is common practice for a company specializing in white pine, for instance, to trade its logs of mixed species for white-pine logs produced by a plant geared to production and marketing of mixed. Sometimes there is mutual advantage, when the quality logs brought in by a stud mill are used as trading stock with a plant producing veneer or quality boards. Outright purchases of logs of certain sizes and quality are more frequent, and perhaps the most significant sorting and exchanging of raw material occurs in those regions where pulpmills are processing round wood. Pulpmills use and often prefer certain species and smaller sizes—material which is hardest for sawmills to handle. The latter are glad to let their smaller material go in exchange for sawlogs developed by the pulpmills' woods operations.

Other factors inherent in the wood-products industry tend to favor the shunting of logs of different descriptions to their highest use, i.e., tend to favor integration.—Sawmilling is and will continue to be a principal industry using Montana's forest resource. Lumber is versatile. Lumber is needed and undoubtedly represents the highest or most valuable use for a large proportion of any large block of timber.

On the other hand, veneer and plywood plants can and do compete for the surface clear and higher grade logs. Logs of peeler or veneer grade generally command up to double the price for sawlogs. So there is a built-in inducement to merchandize peeler-quality logs, and to keep a veneer plant, if there is one, supplied. As will be shown in

table 13 there is enough peeler-grade timber in Montana to sustain six or seven veneer plants in addition to the two already established.

Poles generally return a higher end-product value than when the wood is used for other purposes. So plants for processing poles, piling, barn poles, and house logs have a definite place in any full-use and development plans. Analysis indicates that additional major plants, besides those now located in Bozeman, Butte, and Libby, but in different operating areas, are possible and desirable. The desirability of expanded fencepost production is also indicated.

Montana's vast reservoirs of pulpwood are as yet virtually untapped.—As pulpmills are installed they may take any one of three forms: (1) mills which utilize round wood as a primary source of raw material; (2) operations utilizing wood chipped from sawmill residues; and (3) mills using both sources of raw material. The development of pulping operations utilizing round wood will have the most significant effect on Montana's overall forest industry.

Pulpmills, wherever established and based on round wood, are the key to close utilization. They need sound wood. They are not scavenger operations, but they are and can be large outlets for a great volume of material of certain species and of smaller-size classes that wood-producing plants find difficult or impossible to use. A pulp mill is an essential part of any truly integrated wood-using plant or area. As mentioned earlier, free choice by sawmills of operating areas has left untouched vast areas and volumes of good timber in Montana, suitable for many uses, but occurring principally in the smaller-size classes. If a pulp mill were established in such an area, the feasibility of other wood-using plants would be greatly enhanced. Road costs could be shared. With a chance to dispose of its small logs, a sawmill, for instance, could effect a lowering of its costs and a substantial upgrading of the average size and quality and value of the material it processed. Conversely a pulpmill is in a stronger position when it can derive a part of its raw-material requirements from mill waste—which has already had a free ride to town as part of a sawlog. Actually both types of plant are needed. This is just another way of saying that integration is necessary and desirable for full use and development.

There is a great amount of timber suitable for pulp in Montana. It is good for the purpose as evidenced by the new Waldorf plant at Missoula, based on chips from mill waste from mixed species. It is evidenced also by the shipment of substantial quantities over the last several years of lodgepole-pine pulpwood to Lake States mills more than a thousand miles distant; and by the plans of the St. Regis Pulp & Paper Corp. to install a plant in northwestern Montana. Water and danger of pollution are limiting factors, more than pulpwood availability. But studies by the U.S. Public Health Service, the State health board, and the Forest Service indicate the feasibility of eight pulp plants in the State.

The Forest Service is cognizant of the importance of maintaining high-quality water resources. It can be said authoritatively that the know-how to prevent stream pollution has been developed, but sometimes practice does not fully conform to known techniques. Well-engineered pulpmills at properly chosen sites which incorporate modern technology and equipment, make it possible to have pulpmills and

good streams without adverse impacts on fish and recreation and other water uses. Example mills can be cited to support this statement.

As new pulpmills are operated, pollution problems frequently arise. Their solution may add cost but one of the basic requirements of a successful operation is that the company must be willing to make the installations necessary to prevent pollution. It should be further borne in mind, as a companion part of this, that as new pulpmills are constructed under differing conditions, new problems will arise; therefore, in order to have solutions to these problems there must be a continuing research program.

Fiberboard plants will probably locate in areas of high salvage volumes. Fiberboard and particle board plants have a place under full development, particularly where an abundance of salvage materials are available, such as in the Beaverhead, Deerlodge, Lolo, and Bitterroot Forest areas.

Fencepost production and treating plants are desirable in every timbered area. Most of the material for posts probably will come from thinnings as full development is reached.

Plants producing chemicals from wood are a useful and valuable adjunct to integrated forest industry.—There are no such plants in Montana, mainly because markets are not readily available for chemical products from wood of this area. Plants producing charcoal, wood molasses, and arabogalactin (from western larch) may not be feasible. Wood-molasses plants have particular appeal because of the mutual advantage that would accrue to two of the leading industries in the State—timber and livestock. From wood, molasses can be produced for livestock feed. Probably the most popular use for the limited supply of hardwoods in the river bottoms throughout the State may be for veneer, charcoal and fuelwood. Western larch is known to have a high chemical content. It should be anticipated that one or more chemical-extraction plants may be desirable to process larch-mill residues. Probably chemical-wood plants will offer little competition to sawlog or pulpwood-based industries; rather they will perform a complementary function.

Christmas-tree production from Montana leads the Nation.—Even so, plants for processing Christmas trees and ornaments have more possibilities than are presently realized. While the potentials of Christmas-tree production are being developed to a rather high degree in the Kootenai and Flathead areas, particularly on small private holdings, not as much is being done in the Douglas-fir areas in the rest of the State. Expansion of Christmas-tree yards into Douglas-fir areas east of the Continental Divide is as yet prohibitive until the spruce-budworm epidemic has been controlled. The development of more demand for lodgepole pine, alpine fir, and grand fir as Christmas trees will lead to many opportunities in many communities, as will the preparation of wreaths, cone clusters, incense, etc., from cedar, fir, and pine boughs.

Fuelwood use will continue.—In any consideration of the use of wood for industrial purposes, it should be borne in mind that in Montana's climate a given amount of wood and mill residues, including briquets and presto logs, has been and will be used for fuel. Table 1 shows the estimated amount of fuelwood used in 1957 and the approximate level expected for future use.

LOCATION OF PLANTS

Montana has a vast commercial forest acreage which is producing a large timber resource upon which wood-using industries can be supported. The following summary shows the area and volume of commercial forest by broad ownership classes for the State as a whole.

Summary of area and volume of commercial forest by broad ownership classes, State of Montana

Item	Total	Percent of total
Commercial forest land	17,200,000 acres	100
National forests	10,600,000 acres	60
Other owners	6,600,000 acres	40
Timber volumes:		
Sawtimber (11 inches d.b.h.)	56,000,000 M b.m	100
National forest	40,000,000 M b.m	71
Other owners	16,000,000 M b.m	29
Other products (5–11 inches d.b.h.)	131,000,000 cords	100
National forest	92,000,000 cords	70
Other owners	39,000,000 cords	30

In order to present this inventory data and information concerning the variety and size of plants for which the resource is suited, four major operating areas have been delineated as follows:

WESTERN MONTANA

(All of Montana west of the Continental Divide except the upper Blackfoot River drainage in the Helena National Forest. Fig. 1 (p. 6) shows the locations of wood-using plants in this area)

Following is the estimated acreage and volume of timber in western Montana:

TABLE 1.—*Western Montana timber resource* [1]

Total commercial forest area	acres	9, 600, 000
National forests	do	6, 100, 000
Other ownerships	do	3, 500, 000
Total timber volumes:		
Sawtimber (11 inches d.b.h.)	M b.m	40, 000, 000
Products less than 11 inches d.b.h. (5–11 inches)	cords	80, 000, 000
Salvage material	do	10, 000, 000
Volumes in cull trees (sound wood)	do	3, 200, 000
Hardwood volumes	do	350, 000

[1] Estimates derived from most recent inventory data available, i.e., published forest survey reports for non-national-forest lands, and in the case of national-forest land, from inventory data gathered subsequently.

About one-half of the sawtimber is larch and Douglas-fir, one-fifth is ponderosa pine, and about 12 percent is spruce. Over half of the timber from 5 to 11 inches is lodgepole pine. Although much of the best quality sawtimber has been cut during the past half century, inventory data now indicate about 15 percent of the sawlog volume are surface-clear logs, 20 percent are grade 2 logs (50 percent surface clear), 40 percent are grade 3 logs with numerous small- and medium-tight knots (these saw into a high proportion No. 1 and No. 2 common boards), and about 25 percent are grade 4 (low common) logs.

The most significant entry in table 2 is the 830,000 M b.m. production from trees of sawtimber size. This is because (a) this volume is taken from the sizes and species of trees, and the areas, traditionally worked in western Montana (the areas traditionally worked do not include much of the lodgepole-pine type and other areas running predominately to the smaller size classes); and (*b*) because the estimated sustainable cut of timber suitable for lumber, veneer and large poles, based on sawtimber-size trees from *all* areas, is but 780 MM b.m. Thus there is an apparent overdraft in western Montana of 50 MM b.m. of sawtimber. Because of the large area involved it could be argued that 50 MM b.m. is within the limits of

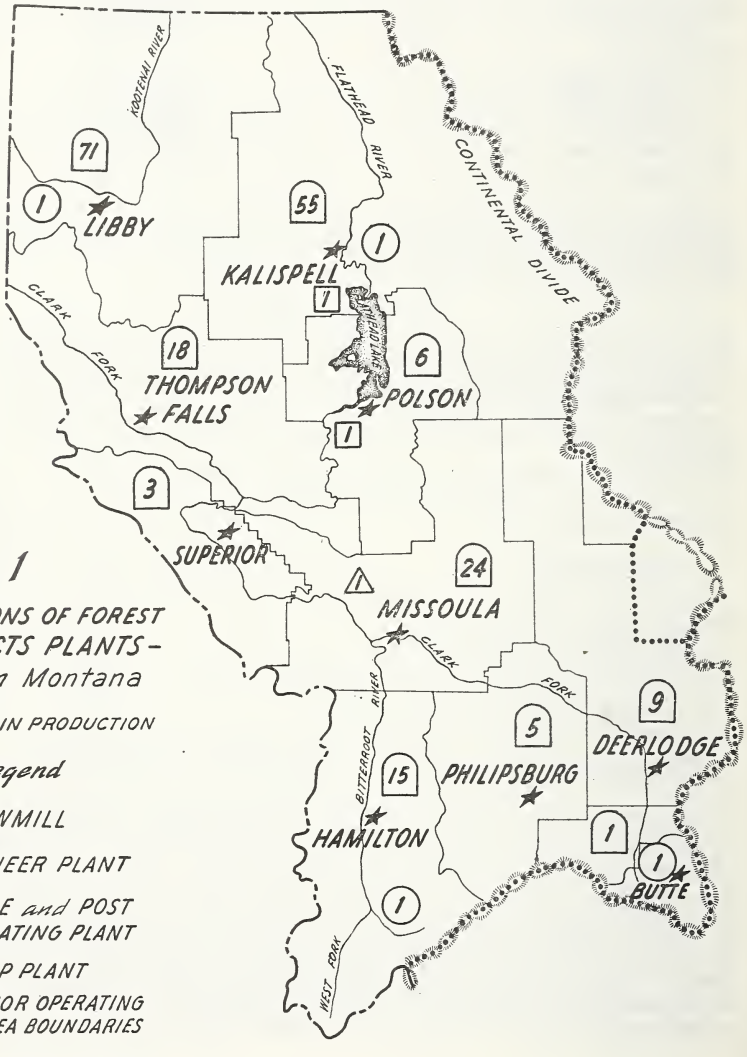


Figure 1

LOCATIONS OF FOREST PRODUCTS PLANTS—Western Montana

error of the estimate. However that may be, this near balance in the whole area certainly does not reflect the very tight requirements-supply situation in parts of the area where competition is extreme and where mills are running short of capacity and some have closed because of scarcity of quality timber locally. Neither does it reflect the unused sustainable cut in some other parts of western Montana.

TABLE 2.—*Estimated production, by products, western Montana, 1957*

Type of product		*Estimated 1957 production* [1]
Lumber and dimension	M b.m.	812, 000
Veneer	do	8, 000
Large poles (30 feet and longer)	M b.m. (97 M pieces)	10, 000
Drain from sawtimber size trees	M b.m.	830, 000
Small poles (less than 30 feet)	M pieces	93
Pulpwood	M cords [2]	4
Fiberboard		0
Fence posts	M pieces	270
Chemical wood		0
Fuelwood	M cords	94
Christmas trees	M trees	3, 520

[1] Production estimates were compiled for each product based on informal surveys by national-forest timber staffmen. These estimates were checked for reasonableness against the most recent Bureau of Census data for each product in previous years.
[2] Exclusive of chips from mill waste.

What the excess of installed capacity ultimately proves to be will depend on the extent to which sawmill operations can and will adjust to the species, sizes, and quality of timber the forests of western Montana produce. Because of the preponderance of national forest land (see table 1), another important factor will be the rate and the extent to which the national forests of this section can be opened up with roads. Access by means of which to salvage heavy losses from fire, insects, disease, and windthrow, and to bring overmature and decadent stands under management, will help greatly.

The following table, which it will be interesting to compare with table 2, presents an estimate of the variety and volume of annual production that the timber resource of western Montana could sustain.

TABLE 3.—*Estimated sustainable annual production, western Montana*

Type of product		*Estimated sustainable annual production* [1]
Lumber and dimension	M b.m.	750, 000
Veneer	do	80, 000
Large poles (30 feet and longer)	M b.m. (250 M pieces)	25, 000
Subtotal	M b.m.	855, 000
Small poles (less than 30 feet)	M pieces	500
Pulpwood	M cords	1, 234
Fiberboard	do	200
Fence posts	M pieces	3, 600
Chemical wood	M cords	88
Fuelwood	do	100
Christmas trees	M trees	5, 000

[1] Sustainable annual production calculations for material harvestable from commercial forest areas of all ownerships were made by the application of even-aged management formulas to area data by timber types. These data were converted to volumes by kinds, species, grades, and size classes by applying the computed area cut over annually to average volumes per acre. Distribution of this annual drain between types of plants was made on an arbitrary basis, taking into account the economic differences between products in a balanced industrial structure.

The production indicated above assumes a maximum of industry adjustment to the kinds and sizes of timber available. For instance, the 855 MM b.m. indicated for lumber, veneer and large poles in table 3 exceeds the 830 MM b.m. actually used (table 2) and the 780 MM b.m. of sawtimber-size trees stated to be available annually from all areas. This is because some mills with new and specialized equipment are already utilizing smaller than sawtimber-size trees, i.e., smaller than 11 inches d.b.h. So it is assumed that more of this may be done. If it is, the present headsaw capacity might continue, but for full use and development the variety of outlets offered by veneer and pole facilities might be best.

The other most significant entry in table 3 is the 1,234 M cords of pulpwood. Pulpwood is the big untapped reservoir of usable raw material and employment and income in western Montana. The 1,234 M cords indicated to be available annually is the equivalent of about 410 MM b.m. and the base for several pulpmills. This is about one-half the volume now used for lumber—a huge raw material base that is now making no contribution and which could be used without conflict with existing industry. Actually, pulpmills could be a boon to existing industry, principally because they can use to good advantage much of the material developed in sawmill-logging operations that is uneconomic to use for lumber. They could even be the means of increasing the volume of available sawtimber from stands not now being operated. It is not practicable to high grade such stands for the larger size, but they become operable when there is an outlet for every thing that can be brought out.

From a forestry standpoint, pulpmills in conjunction with other wood-using plants, are the solution to many vexing problems.—Essentially they are the means by which utilization can be improved. Better utilization means easier fire protection. It means fewer tops and small trees left in the logging woods, easier and less costly problems of area rehabilitation and stand regeneration, and even more important, it means the harvesting of areas that need to be harvested and brought under management but which are now uneconomic for the installed capacity, principally sawmills, to utilize.

Pulpmills provide outlets for thinnings and enable land managers to conduct one of the most important cultural operations incident to bringing young stands through to thrifty growing forests. In western Montana great fires of the past are responsible for hundreds of thousands of acres of grossly overstocked stands. Where there was a double burn nothing came back, but elsewhere thinning operations are needed to avoid stagnation. If the older of these stands can be thinned on a commercial basis, there is some hope that it will be done. Too much of western Montana forest land is presently making no economic contribution and the practice of intensive forestry is retarded. Access roads into young stands are needed to capitalize on these opportunities.

SOUTHWESTERN MONTANA

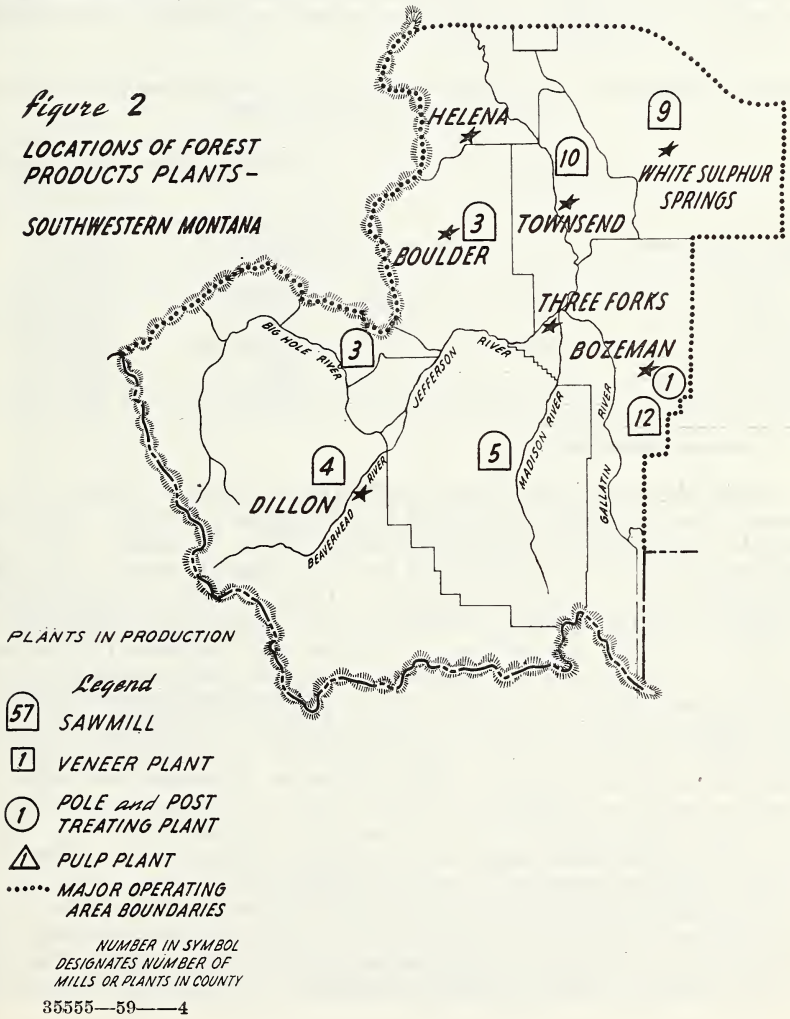
(Essentially the upper Missouri Basin above Canyon Ferry Dam)

Figure 2 (see below) shows the location of wood-using plants in southwestern Montana. In this subdivision of the State are found the following resources:

TABLE 4.—*Southwestern Montana timber resource* [1]

Total commercial forest area	acres	3, 200, 000
National forests	do	2, 500, 000
Other ownerships	do	700, 000
Total timber volumes:		
Sawtimber (11 inches d.b.h.)	M b.m	8, 000, 000
Products less than 11 inches d.b.h. (5–11 inches)	cords	31, 000, 000
Salvage material	do	7, 000, 000
Volume in cull trees	do	750, 000
Hardwood volumes	do	200, 000

[1] See footnote to table 1.



35555—59——4

Nearly 60 percent of the Douglas-fir and 70 percent of the lodgepole pine lying east of the Continental Divide is found in this area. The sawtimber is composed mainly of Douglas-fir (40 percent), lodgepole pine (30 percent), and spruce (20 percent). Two-thirds of the products 5–11 inches d.b.h. are lodgepole pine and 22 percent is Douglas-fir. Over one-half (54 percent) of the sawtimber volumes are grade 3 logs, and about one-third (34 percent) are in grade 4 logs, there being only 3 percent No. 1 (surface clear) logs, and 9 percent No. 2 (50 percent surface clear) logs. Fifty percent of the volume of products from 5 to 11 inches d.b.h. are from 9 to 10.9 inches; 37 percent are 7 to 8.9 inches; and 13 percent are 5 to 6.9 inches.

The outstanding characteristics of this operating area are the high proportion of national-forest ownership, the large volumes of material less than sawtimber size, and the high proportion of dead salvable material. Except for parts of the Gallatin Forest and the Lewis and Clark National Forest in Meagher County, this area has not been developed and much of the timber is inaccessible. Therefore, as shown in table 5, the difference between actual production and possible sustainable production is great.

TABLE 5.—*Estimated 1957 production compared with estimated sustainable annual production,*[1] *southwestern Montana*

Type of product	Estimated 1957 production	Estimated annual sustainable production
Lumber and dimension	56,000 M b.m	180,000 M.
Veneer (sliced)	None	16,000 M.
Poles:		
Large	29,000 pieces	100,000 pieces.
Small	34,000 pieces	200,000 pieces.
Pulpwood	10,000 cords	550,000 cords.
Fiberboard	None	80,000 cords.
Fence posts	81,000 pieces	1,800,000 pieces.
Chemical wood	None	66,000 cords.
Fuelwood	29,000 cords	30,000 cords.
Christmas trees	16,500 trees	1,000,000 trees.

[1] See footnote 1 of tables 2 and 3.

Again, the sustainable annual production by types of product shown above was arbitrarily determined but is suggestive at least of a desirable integration of industry in southwestern Montana. There is sufficient timber of the right kind for the indicated variety and levels of production. In parts of the area (Gallatin Forest and Meagher County) installed headsaw capacity is substantial, and utilization is excellent. Thus, most of the indicated room for expansion of lumber, veneer and large-pole production is elsewhere (the Beaverhead area and the east portion of the Deerlodge and Helena National Forests). It is notable that sawmills in Gallatin Forest and in Meagher County are doing much of the job that needs to be done without an assist from other kinds of plants. This is because these mills are new and modern and were designed and built from the ground up to handle small logs efficiently and to do a good job of manufacture on them. In this respect these plants are in marked contrast to the older big-timber mills characteristic of western Montana.

Notwithstanding the success of the new-type sawmills, integration of industry in the larger area is needed.—For one thing the inventory and sustainable cut of pulpwood are enormous and a pulpwood outlet would make for a better industrial balance. It would find a mutually

advantageous source of chips from sawmill residues, and would have the effect, very probably, of increasing the average size and operating margin of material processed by sawmills. Another factor calling for pulp outlets, particularly in the Beaverhead-Deerlodge country, is the very large component of available pulpwood stands that are long dead from insect attack. Much of this is still upright but some is leaning and arranged in jackstraw fashion on and above the ground. That which is not in contact with the ground is still sound and has rated very high in recent pulping tests, but it is worthless for lumber because of checking. Any sawmill operator logging the green timber only from such an area would find the dead a formidable and costly obstacle. However, removal of green plus dead as it is encountered, with a purpose to sort and distribute to pulp and other outlets, could make it an attractive logging show.

Sliced veneer, such as obtainable from high-grade common-type logs from southwestern Montana, is an attractive, usable product not now marketed but with real potential, it would appear. A moderate portion of the available annual cut has been "allocated" to veneer plants, as part of a full use and development proposal.

The potential for increased pole production is very large as it is with all the rest of the primary products listed. Of course, if actual development should be greater in some products than indicated, there would be correspondingly lesser room for others.

Increased Christmas-tree production in southwestern Montana is a real possibility, but must await control, by natural or other means, of the spruce-budworm infestation.

With as much salvable material as there is in this section the raw material base for such fiberboard, chemical, wood molasses, and other bulk wood-using plants as might be established, is practically unlimited.

NORTHEASTERN MONTANA

(Includes the counties of northeastern Montana lying within or adjacent to the lower Missouri drainage, plus the upper Blackfoot Basin west of the Continental Divide lying within or contiguous to the Helena National Forest. See fig. 3, p. 12)

The commercial timber resources in this area are estimated as follows:

TABLE 6.—*Northeastern Montana timber resources* [1]

Total commercial forest area	acres	2, 600, 000
National forests	do	1, 000, 000
Other ownerships	do	1, 600, 000
Total timber volumes:		
Sawtimber (11 inches d.b.h.)	M b.m	4, 000, 000
Products less than 11 inches d.b.h	cords	11, 000, 000
Salvage material	do	4, 000, 000
Volumes in cull trees	do	450, 000
Hardwood volumes	do	650, 000

[1] See footnote to table 1.

Nearly one-half (47 percent) of the total sawtimber volume is Douglas fir; one-fourth is lodgepole pine. Ponderosa pine and spruce are found in nearly equal proportions (15 percent each). Of the products 5–11 inches d.b.h., 60 percent is lodgepole pine, and 25 percent is Douglas fir. Of the sawlog volumes, 4 percent are grade 1, 15 percent grade 2, 47 percent grade 3, and 34 percent grade 4.

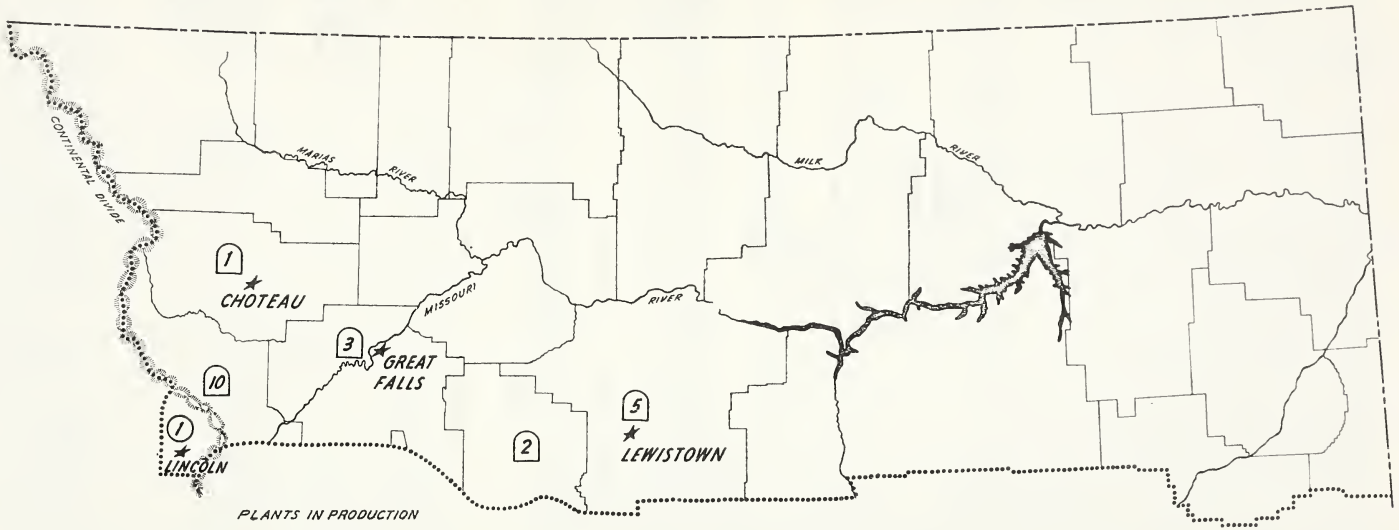


Figure 3

LOCATIONS OF FOREST PRODUCTS PLANTS—

NORTHEASTERN MONTANA

Northeastern Montana is characterized by a higher proportion of commercial forest land in ownerships other than national forest. It does not have as much sawtimber, nor nearly as much material less than 11 inches d.b.h. as western or southwestern Montana. Timber stands occur over a wide expanse of country, although most of the volume is found in four general localities, i.e.,Fergus County, the north side of the Belts, the east slope of the northern Rockies, and the upper Blackfoot River Basin. Many stands are of a younger-age class than in the other major operating areas and thus by comparison are of better vigor. While there are many stands now in immediate need of harvesting, in the overall the need for development is not as pressing as in the other three major areas.

Production during 1957, compared with estimated annual sustainable production, is shown in the table as follows:

TABLE 7.—*Estimated 1957 production compared with estimated sustainable annual production,*[1] *northeastern Montana*

Type of product	Estimated 1957 production	Estimated annual sustainable production
Lumber and dimension	20,000 M b.m	75,000 M b.m.
Veneer	None	16,000 M b.m.
Large poles	None	50,000 pieces.
Small poles	7,000 pieces	100,000 pieces.
Pulpwood	13,000 cords	261,000 cords.
Fiberboard	None	40,000 cords.
Fence posts	78,000 pieces	900,000 pieces.
Chemical wood	None	26,000 cords.
Fuelwood	13,000 cords	20,000 cords.
Christmas trees	52,000 trees	500,000 trees.

[1] See footnote 1, tables 2 and 3.

The comparison shows that all types of production can be expanded considerably. In need of solution here is the problem of concentrating the products indicated so that maximum advantage can be taken of their relative attributes. For example, sawmills can be located relatively close to the areas of sawtimber inventories, such as those now at Lincoln. Rail and truck heads near timbered areas appear to be Augusta, Choteau, Armington, Hobson, and Lewiston. Whether or not sawmills are feasible at these sites is still to be determined. Needed, however, are the additional plants and facilities to fully utilize those products which either will yield higher returns than boards or cannot be utilized by sawmills. Included in the first category is material suitable for sliced veneer and power poles; in the second category are the materials usable for small poles, pulp, fiberboard, and chemical-wood and sawmill residues.

A key to solving the problem of blocks of timber separated by distance and plains, is probably the establishment of an integrated series of plants, including veneer, poles, pulp and fiber board, at a site or sites centrally located so that the concentration of round-wood products is made possible. Such a site available to both rail and highway transportation, and water and power resources, seems possible on the Missouri River.

Veneer, fuelwood, and possible charcoal use will probably utilize the hardwoods found along the stream bottoms throughout the area.

Christmas-tree production will not be feasible until successful control of the spruce budworm and other pests and diseases of Douglas fir has been established.

SOUTHEASTERN MONTANA

(Includes the counties of southeastern Montana lying within or contiguous to the Yellowstone River. Included here also is the Bull Mountain area of Musselshell County)

Figure 4 (p. 15) shows the location of wood-using plants in southeastern Montana. In this subdivision of the State are found the following resources:

TABLE 8.—*Southeastern Montana timber resources* [1]

Total commercial forest area	acres	1, 800, 000
National forests	do	1, 000, 000
Other ownerships	do	800, 000
Total timber volumes:		
Sawtimber (11 inches d.b.h.)	M b.m.	4, 000, 000
Products less than 11 inches d.b.h. (5–11 inches)	cords	9, 000, 000
Salvage material	do	1, 500, 000
Volumes in cull trees	do	200, 000
Hardwood volumes	do	300, 000

[1] See footnote to table 1.

Only 2 percent of the sawtimber volume is in grade 1 logs; 9 percent is in grade 2 logs; 46 percent in grade 3 logs; and 43 percent is in grade 4 logs.

About 50 percent (1,000,000 M b.m.) of the ponderosa pine in eastern Montana is in this area. Ponderosa pine, lodgepole pine, and Douglas fir occur in about equal quantities, the lodgepole pine and Douglas fir being found in the upper reaches of the Yellowstone drainage while ponderosa pine, occurring in pure stands, is the only major softwood species found east of Billings. The lesser volumes per acre and poorer quality are offset to some extent by easier terrain problems and by being closer to treeless-area markets. Some of the first cuttings in Montana were made in this area. Many of the present stands reflect these cuttings in that second growth or remnant mature shelterwood stands left from previous cutting operations are preponderant. There is a considerable unused resource available in the area. As shown in table 9, there is still a great gap between actual production and possible sustainable production.

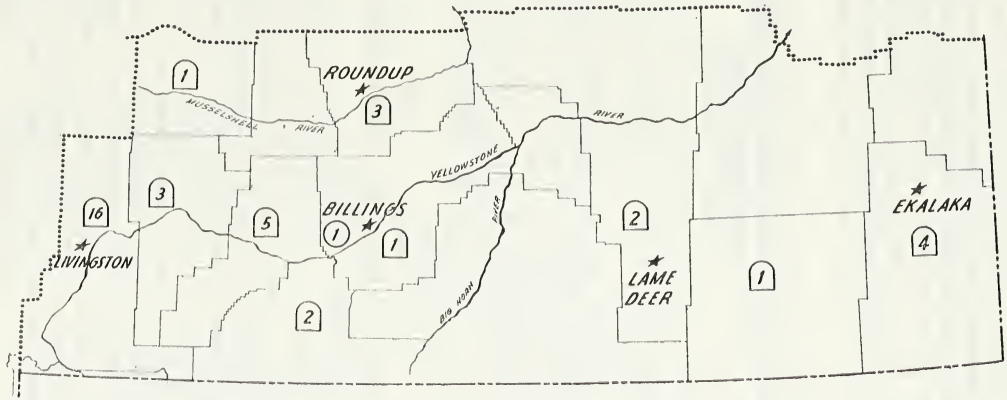
TABLE 9.—*Estimated 1957 production compared with estimated sustainable annual production,*[1] *southeastern Montana*

Type of product	Estimated 1957 production	Estimated annual sustainable production
Lumber and dimension	54,000 M	60,000 M b.m.
Veneer (sliced)	None	16,000 M b.m.
Poles:		
Large	do	50,000 pieces.
Small	50,000 pieces	100,000 pieces.
Pulpwood	None	150,000 cords.
Fiberboard	do	40,000 cords.
Fence posts	305,000 pieces	600,000 pieces.
Chemical wood	None	26,000 cords.
Christmas trees	Local use only	Local use only.

[1] See footnote 1 of tables 2 and 3.

Figure 4

LOCATIONS OF FOREST PRODUCTS PLANTS – SOUTHEASTERN MONTANA



PLANTS IN PRODUCTION

Legend

- 57 SAWMILL
- 1 VENEER PLANT
- (1) POLE and POST TREATING PLANT
- △ PULP PLANT
- ····· MAJOR OPERATING AREA BOUNDARIES

NUMBER IN SYMBOL DESIGNATES NUMBER OF MILLS OR PLANTS IN COUNTY

Again, the sustainable production by types of product shown above was arbitrarily determined but is suggestive of a desirable integration of industry in southestern Montana. While there is not as much timber in this area to provide volume production and industrial variety, there is an opportunity to install a fiber-using industry to utilize sawmill residues and salvage materials available in the upper Yellowstone area where installed headsaw capacity is already substantial and further integration is desirable.

The establishment of a pulpmill on the Yellowstone is considered possible.—While only a modest annual pulpwood supply (150,000 cords) is sustainable in the area, excess round-wood and mill residues from the nearby Gallatin area are not too distant. Some consideration must also be given to the extensive lodgepole-pine areas of northern Wyoming which do not have sufficient local water resources to make pulp manufacture possible.

One problem of recent development concerns the headsaw capacity of the timbered area in the vicinity of Lamedeer and Ashland. The modern mill at Lamedeer burned during the past year. Apparently the company owning the mill does not plan to rebuild it. Needed in the area is a mill of sufficient size and stability to utilize the allowable annual cut of ponderosa pine from the Indian, national forest, and private holdings, so that local employment and community stability can be continued.

Power-pole production might well be feasible from the lodgepole-pine stands of the upper Yellowstone. However, the present sawmill industry is now using much of the available material for lumber.

A thriving fence-post and small-pole industry is already in evidence in the three plants in the area. The establishment of more such plants in areas with extensive young stands will serve an important function in thinning overstocked stands.

OPPORTUNITIES TO EXPAND SECONDARY MANUFACTURING

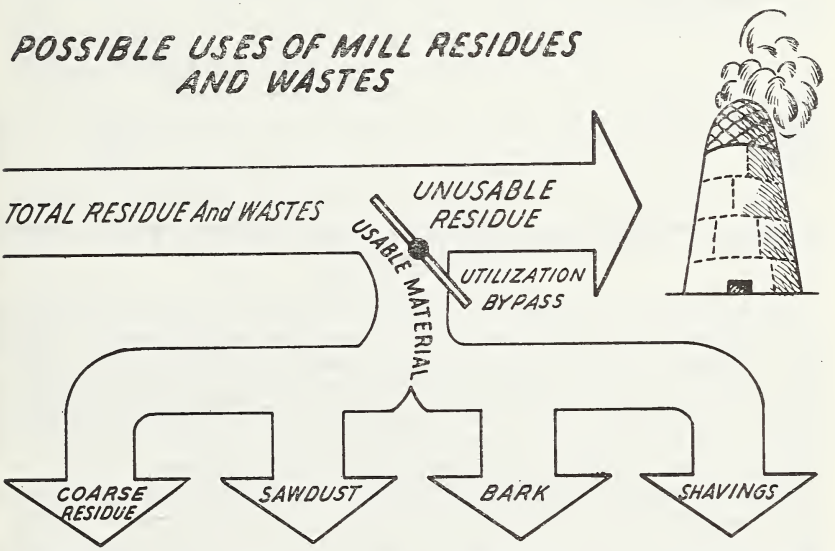
The benefits of remanufacture cannot be emphasized too strongly. Remanufacturing boards into finished products increases their value; as furniture the value is increased manyfold. Laminated beams are worth several times the value of dimension stock, of which they are composed, and so it is with plywood as contrasted with green veneer, and paper with pulp. More secondary manufacture would greatly enhance the value of Montana's timber products, increase profits, and permit better utilization, which in turn leads to better forestry.

Not only does secondary manufacturing increase the worth of forest products; the effect on number of jobs and employment stability is equally important. Secondary manufacture also attracts supporting industries, such as suppliers of services, and dealers in equipment and supplies.

In the areas where sawmill headrig capacity equals or exceeds the sustainable supply of sawlogs, a shift to plants using boards rather than logs for raw material is essential if present levels of employment and industrial activity are to be maintained or increased.

The extent to which secondary manufacturing is possible is closely associated with the amounts, kinds, and locations of primary forest products produced—all favorable factors so far as Montana is concerned. Some timber companies and some others are already in the field. There are, for instance, three plants turning out laminated beams, there are sash and door factories, producers of edge-glued panel stock, grain doors, snowfences, prefabricated houses, precut fence stock for yards and patios, cabinet shops, pole-processing plants, molding, flooring, and others. But nearly every lumber manufacturer ships many a carload destined for out-of-State plants that will apply labor and machinery to boards or other primary product, increase its value and profit thereby. More of this added employment and income is needed right here at home.

A partial list of the possible uses of these residues is shown in the accompanying chart:



COARSE RESIDUE	SAWDUST	BARK	SHAVINGS
FUELWOOD	FUEL	HOG FUEL	AGRICULTURE
HOG FUEL	AGRICULTURE	AGRICULTURE	FLAKEBOARD
CHIPS	BRIQUETS	EXTENDERS	WOOD FLOUR
LATH	WOOD FLOUR	FILLERS	BRIQUETS
CUT-STOCK	SWEEPING COMPOUNDS	OIL DRILLING COMPOUND	CHEMICAL EXTRACTION*
EDGE- & END GLUED STOCK	SAWDUST-CEMENT CONCRETE*	WAX*	INSULATION*
CHARCOAL	PULP*	CORK*	
CHEMICAL EXTRACTION*	EXTRACTIVES*		
	INSULATION*		
	ETHYL ALCOHOL*		
	MOLASSES*		

*EITHER LIMITED AT PRESENT OR IN NEED OF TECHNOLOGICAL ADVANCEMENT TO BECOME ECONOMICAL.

New ideas, new products, and new technology are being studied by Montana operators and there are definite plans and intentions to produce such items as fiberboard and boards with paper overlay. In the latter operation, of which there is already one in the State, resin-impregnated paper is sealed over common lumber to improve its surface, paintability, value, and usefulness. The plea here is simply for more of this kind of upgrading. Increasingly Nos. 3, 4, and 5 common boards cannot be sold as such. They need further processing. Papermills should closely follow construction of pulp facilities. The plants at Lewiston, Idaho, and Spokane, Wash., demonstrate that conversion of pulp to paper can be a successful local enterprise. It doubles employment and income possibilities.

Volumes of mill residues are important. Studies indicate the following approximate quantities of residues are produced from an average medium-sized sawmill producing lumber at a rate of 60 M b.m. per 8-hour shift:

	Cubic feet	Tons (dry weight)
Coarse residue	1,300	19
Bark	1,200	17
Sawdust	1,100	15
Shavings	550	7

MARKET POTENTIALS WITHIN AND BEYOND THE STATE OF MONTANA

The problem of the Montana timber industry has traditionally been one of lack of markets. However, all signs point to a new era in which the difficulty of marketing timber products will diminish. This optimistic conclusion can be drawn from two situations: The long-run prospective climb of wood needs in the United States, and the obvious inability of the Nation to satisfy greatly larger wood requirements without drawing heavily upon Mountain States timber.

Montana's market future rests first of all on the fact that the Nation has potential need for twice as much wood as it is now using. In 1952 the sawtimber cut in the United States was 49 billion board feet. The long-range outlook indicates that our needs for sawtimber may climb to as much as 68 billion board feet by 1975 and 105 billion board feet by the year 2000.

The opportunity for Montana is underscored by the fact that doubling the timber output of the United States or even increasing it 50 percent is no small order. While the theoretical maximum sawtimber growth in the United States is high, perhaps as high as 200 billion board feet annually, that amount of growth probably cannot be achieved with present knowledge of timber growing and under present economic conditions. Forest Service timber growth specialists feel that an annual sawtimber growth of about 100 billion board feet is probably a more practical and conservative estimate.

The fact that possible future timber needs would use up all of a reasonable national growth capacity is by itself evidence that there will eventually be a market for practically all of Montana's timber. Since much of the commercial forests outside of the Mountain States

has been heavily overcut and will require time to regain full productivity, "eventually" will probably come sooner than most people realize.

Another favorable factor, of course, is that the Mountain States are becoming an increasingly important market in their own right. Population of the eight States has been rising much more rapidly than the national population, and it is expected to continue to rise more rapidly in the future. There were 5 million people in the region in 1950 and the total is expected to climb to 14 million by the end of the century.

Montana's present population is 671,000 people. Prospects are that by 1975 there will be from 800,000 to 1 million people in the State. Presently about 330 million board feet of lumber are consumed annually in the State, about one-third of the 1957 lumber production. If Montana's long-range lumber production stays more or less at the present level it may be presumed that as the population increases a greater quantity of the Montana lumber will be marketed within the State. In any case, the growth of nearby markets should make Montana timber industries increasingly competitive.

Montana lumber production has more than doubled since World War II.—Some of the new outlets which have made expanded lumber production possible have been within the State (for example, the consumption of lumber in Montana increased nearly 60 percent between 1940 and 1953–55). However, in the same period Montana lumber shipments to other States more than tripled. This underscores a most important point: The future of the Montana lumber industry is largely tied to the national market. The Nation produced 34 billion board feet [1] of sawlogs and lumber in 1957. Medium projected demand for lumber in the United States is estimated at 55.5 billion board feet in 1975 and about 79 billion in 2000.[2] At present almost 60 percent of the lumber output of the State is of soft-textured species, as table 10 shows. These soft-textured softwoods have enjoyed considerable demand over the Nation as a whole. However, like the redwood and other specialty species, they are not universally present. As a matter of fact, almost one-third of the national production of such wood comes from the Mountain States. It is a national market which has placed premium value on these soft-textured species. For example, the real price of all lumber has risen 60 percent since 1939. The price of white pine has risen 84 percent in that period, ponderosa pine 89 percent, and spruce 72 percent. In the long run, most favorable prices will come from continuing to sell in the national market.

TABLE 10.—*Montana lumber production 1956*

	M b.m.
Ponderosa pine	157
White pine	39
Lodgepole pine	45
Spruce	[1] 340
Subtotal	581
Other species	400
Total	981

[1] The high spruce cut resulted from the recent spruce bark beetle infestation control program, and a concerted effort to develop markets for spruce lumber. The necessary future reduction in spruce production can be offset by an increase in lodgepole pine if a similar effective trade promotion effort is made.

[1] See "The Demand and Price Situation for Forest Products," Forest Service and CSS, USDA, November 1958.

[2] See p. 422, "Timber Resources for America's Future."

One of the interesting features of the lumber distribution situation is that Montana shipments to Plains, Central, and Eastern States are more than 20 times greater than shipments to other Mountain States. The movement of lumber from Montana to the other Mountain States has always been relatively small. Presumably, the fact that the main railroad lines run east and west has something to do with this. In any case, the possibilities of marketing more Montana lumber in the other Mountain States should be critically examined.

The consumption of veneer logs and bolts has increased tenfold in the past 50 years.—In the last two decades the production of softwood veneer logs has increased from 460 million board feet to 2.6 billion board feet. The ease with which this softwood plywood can be used and installed had made it popular with builders. It is extensively used in roof sheathing, exterior wall facing, subflooring, on interior walls and ceilings, and in built-ins.

As with pulp products, veneer and plywood demand apparently is going to continue to climb. The outlook for veneer logs is highly favorable. Table 11 shows that the consumption of veneer logs is expected at least to triple by the end of the century. In 1952 use of timber for veneer and plywood was about 7 percent of lumber use. By the end of the century, veneer and plywood demands are expected to be 12 to 15 percent as high as lumber demands.

TABLE 11.—*Veneer log consumption*

	Billion board feet
1952	2. 6
1957	3. 3
2000	
Lower projection	7. 5
Medium projection	9. 0
Upper projection	10. 5

The prospective climb of veneer and plywood needs is doubly significant because this industry is perhaps the most demanding of all the timber industries so far as quality of raw material is concerned. Montana has a large volume of timber suitable for veneer and plywood. Thus, the market outlook for these products offers an industrial opportunity for Montana. There are presently two veneer plants in the State.

The consumption of woodpulp in the United States has increased twentyfold since 1900, as paper bottles, cleansing tissues, building boards, and a myriad of other woodpulp products have skyrocketed into prominence. As a consequence, 16 percent of the total timber cut in 1952 was for pulp products.

Long-run-outlook studies indicate that the rapid rise of pulp and paper demand will continue. It has been estimated that the demand for pulpwood in 1975 may be 64 percent higher than in 1956. Demand for wood-fiber products is expected to climb from the 1952 level of 35 million cords (in terms of pulpwood) to 100 million cords by the end of the century, according to the "Timber Resource Review." At that time, about one-fourth of the timber cut in the United States will be for fiber use.

It can be said with considerable confidence that the wood needs for pulp will bring more pulp and paper mills into Montana. The Mountain States have a big part of the unutilized wood-fiber resource. It is almost a foregone conclusion, therefore, that expansion of the in-

dustry to the levels contemplated will require large-scale use of Montana timber for this purpose. Recent successes in using hardwoods for pulp open up the large hardwood resources east of the Mississippi. Whether the next surge of pulpmill expansion in the United States will be largely in the hardwoods of the East or in the softwoods of the West, time alone will tell. It seems likely, however, that since the ice has been broken by Montana's first pulpmill, others will follow before long.

The preceding pulpwood statistics include the so-called fiberboard or composition-board industry. High-density boards (such as Masonite), low-density boards (such as Celotex), and medium-density boards (such as Tenex) all have been in increasing demand. Approximately 1.7 million tons of these products were consumed in the United States during 1955, which was 10 times greater than the consumption in 1940. The "Timber Resource Review" estimates that the Nation may be consuming 3.5 million tons or more annually by the year 1975.

There will be considerable opportunity for new fiberboard plants somewhere.—However, we find difficulty anticipating how much of this type of development will take place in Montana. Low-density boards are becoming more popular for insulation and sheathing and therefore have something of a bulk market. A plant, or plants, in Montana should have some competitive advantages in the Mountain States and Plains States markets.

High-density and medium-density boards represent a somewhat different situation because of their more specialized uses. Bulk outlets are fewer locally but some Montana operators have sales outlets and organizations that could doubtless warrant their production.

Although there are no wood fiberboard plants in Montana today, the market for such material is growing and is creating an industrial opportunity of presently unknown proportions.

Montana produces about 3 percent of the utility poles in the United States.—During the period 1947–57, the annual output from this State averaged about 200,000 poles. However, this has been characteristically an unstable industry with wide variation in production from year to year. In 1955, for example, 138,000 poles were produced. Production of commercially treated poles jumped to 304,000 in 1956 but slid back to 178,000 in 1957. It appears that 1958 will be another big year.

As table 12 shows, one-sixth of the pole production is larch and three-fourths is lodgepole pine. The future of Montana's pole industry is largely tied to these two species.

TABLE 12.—*Treated commercial pole production in Montana, 1957* [1]

	M pieces
Western redcedar	6
Lodgepole pine	132
Western larch	31
Douglas-fir	9
Total	178

[1] In addition to this production, an estimated 12,000 small untreated poles were produced.

Demand for larch poles of the longer lengths has increased. Larch combines the qualities of great strength, large size, and good form. A continuing demand for larch poles can be expected. The treating

process requires the wide sapwood of the fastest growing trees. This limits the supply because larch stands of pole size are generally slow growing.

Lodgepole pine is a straight, sturdy tree which is easy to cut, fit, and handle. These characteristics make it very suitable for small utility poles. Lodgepole-pine poles have been produced in Montana at the rate of 91,000 to 269,000 annually for the past decade. Such insight as there is into the competitive pole situation suggests that the market for these poles will continue to be at least this large and may be expanded.

The big unknown in the small-pole field is the future of pole-frame building construction. In this type of building the basic structural element is a series of treated poles set in the ground or on a foundation. An increasing number of pole-frame warehouses are being built because per-square-foot costs are extremely low. The same building principle can be applied to farm structures and homes. In fact, this may turn out to be one answer to the high cost of construction. To the extent that pole-frame structures become more common, the market for small poles will increase. This development could, in fact, open great new vistas for small-pole species like lodgepole pine.

Fence posts have always been an important but unspectacular portion of Montana's timber production.—These posts have been cut by local farmers and small operators shipping posts to the Plains and Mountain States. In recent years, however, changes have occurred in the post situation which give this enterprise a new attractiveness as a business opportunity.

As farms have become larger and farming more specialized more farmers have turned to lumberyards for their posts. They no longer are satisfied with untreated posts because higher labor costs of installation make the longer lived treated posts more economical. A mass market for commercially produced posts is thus developing. The Federal highway program creates additional fencing needs. This total market therefore is becoming attractive to persons looking for small-business opportunities. Specialized lathes have been developed for producing uniform round posts. Facilities have likewise been developed for large-scale treating operations. Presharpened posts for machine driving are finding a place in the market.

Today Montana has 7 modern post producers who supplied nearly 80 percent of the 730,000 posts produced in the State during 1957. How large the industry could be can only be guessed. The forests of the State could supply millions of posts annually, so the problem is primarily one of market development and promotion effort.

Considerable attention has been given to the possibility of chemical use of Montana timber.—One of the possibilities has been the extraction of arabogalactin from larch. As a matter of fact, there was at one time a plant in Eureka which made mucic acid from arabogalactin. The acid was used in manufacturing baking powder, effervescent drinks, and various pharmaceutical preparations. Uses of arabogalactin are still being studied, and this and other chemical use may yet open some industrial opportunities.

Wood molasses and fodder-yeast production, much discussed a decade ago, could become a reality. These products can be made from wood waste and used as livestock-feed supplements. They have been fed experimentally in rations for beef and dairy cattle,

sheep, and poultry with results equally as good as with other supplements. The material was supplied by the Forest Products Laboratory of the Forest Service and tests were conducted by the Agricultural Experiment Stations of Montana, Wyoming, Idaho, and Washington. Wood molasses has been produced in pilot plants, and during the war and subsequently commercial plants produced alcohol from the same wood sugars that can be fed directly to livestock, or used to nourish yeast which itself is a protein-feed supplement. Cheap blackstrap molasses from Cuba has been the competition which discouraged production of wood-sugar molasses. However, it is possible that recent new developments in the Montana livestock industry may warrant a reappraisal of the possibilities. Cattle growers formerly looked to the heavily populated Midwest and East for markets. Now they ship west and southwest too, and the move to establish local feed lots has already begun. It is possible that delivered costs of blackstrap may be such as to encourage local production of wood molasses.

The use of Christmas trees in the United States has been rising and consumption is now in excess of 40 million trees annually, including 28 million produced in domestic forests and 12 million imported from Canada.[1]

Montana produces about 10 percent of the Christmas trees used in the United States. For a long time, production in the State has fluctuated around 3 million trees annually. In 1956 production reached a new high of 4.2 million trees. Shipments totaled 3.7 million trees in 1957. Although local trees run into stiff competition from wild and plantation-grown trees in other regions, there are no signs as yet that the national market will not be able to continue to absorb 3 million trees annually. As a matter of fact, if quality standards are maintained at a level which keeps Montana trees competitive, there is no reason why there should not be a market for substantially more than 3 million of them annually in years to come.

RECOGNITION OF SUPPLY PROBLEMS THAT MAY AFFECT EXISTING PLANTS

A number of problems related to forest-management needs definitely affect supplies to existing plants. The first of these is the problem of salvaging a maximum of available dead timber before it deteriorates. This means harvesting endemic and epidemic mortality losses early. Over 20 million cords of salvable material resulting from past insect and disease epidemics is available for use if harvested from the forests of Montana. Salvage of this volume is very important to existing and proposed plants in all areas.

Better logging equipment is needed.—One of the most difficult supply problems is concerned with learning how to log more efficiently and less destructively. Efficient logging and handling of small timber, as in lodgepole-pine stands, has yet to be learned. Full efficiency has not been gained in yarding, loading, and hauling forest products to the plants. By the same token, improvement is needed in hauling and loading finished products from plant yards into freight cars.

[1] Reference: "The Demand and Price Situation for Forest Products," Forest Service and CSS, USDA, November 1958.

Idle lands do not contribute timber supplies to existing plants.—There are 511,300 acres of nonstocked commercial forest area in Montana of which 356,000 acres are in western Montana where the problem of headrig overcapacity now exists. It is sometimes argued that it will take such a long period for these idle lands to produce timber that they cannot help an existing plant in short supply, but this is not the way it works entirely.

Timber must be managed, under principles of sustained yield. Thus, assuming a 100-year rotation, under even-aged management 1 percent of the area should be cut each year. If a forest contains 1,000 acres, an average of 10 acres a year should be harvested. However, if 100 acres of the 1,000 acres are not producing, only 9 acres a year can be harvested if a hiatus is to be prevented near the end of the rotation. In other words, 10 percent less area can be harvested if the nonstocked areas are not producing than if these same areas are producing. This credit can immediately be taken advantage of by harvesting an added 10 percent of the area as soon as the areas are placed in production.

Poorly stocked stands also pose a supply problem. If stands are poorly stocked, production less than desirable will result. Such lands are partially idle. In Montana, a total of 1,700,000 acres of commercial forest area are less than 40 percent stocked. Of course, little can be done to improve stocking in sawtimber and pole-sized stands until the areas are harvested and a new stand is started. However, in the case of poorly stocked seedling and sapling stands, productivity can be increased and stand composition bettered by "fill in" planting just as the nonstocked areas are placed in production. Records show that Montana has 461,000 acres of poorly stocked seedling and sapling stands of which 222,000 acres occur in western Montana. A 100 percent increase in production from these acres will result if restored to an adequate stocking level.

A corollary to poor stocking is overstocking.—The precise degree to which commercial forest stands should be stocked has not been established in Montana. More research is needed to establish this. However, it is certain that optimum stocking will vary with species and site. It is further quite apparent that optimum stocking, and thus optimum productivity, does not require a complete closure of the overhead canopy. Rather, optimum stocking density is thought to be at a point not exceeding a 70 percent level of stocking. Stands in Montana which exceed this stocking level are probably overstocked because of soil and moisture supplies. In other words, when there are too many stems on an area, growth is placed on too many trees. As a result, diameters and heights are reduced and usable volume does not meet the needs of industry. In the case of overstocked stands, the problem in sawtimber, and often in pole-sized stands, can be readily solved by commercial thinning, if there are roads. However, noncommercial thinnings must be made in overstocked seedling, sapling, and small pole-sized stands. Studies here show that gains in usable growth can be as much as 100–200 percent in overstocked stands that have been thinned. It is considered that at least one-third of the seedling, saplings, and pole-sized stands in Montana are overstocked. This amounts to about 3 million acres. It can be readily seen that a tremendous gain in increment can be obtained by thinning overstocked stands at proper time intervals. Thinnings, including weed-

ing, totaling 115,000 M b.m. of sawtimber and 770,000 cords of material can be harvested annually if roads are provided in these young stands. Such gain in material is transferable to industrial use as the forest management work is accomplished. Access to these stands for management work, of course, is a basic need.

A further supply problem that may well affect plants is the need to improve the composition and quality of Montana forests. In most cases, selective crop tree pruning and weeding should be confined to young growing stands. Pruning young trees can be shown to increase materially the surface quality of the lower logs and thus the market value of lumber or veneer products. By the same token, inherent value differences in species in many cases make it possible to encourage through weeding the development of selected crop trees of a given species. For example, in the ponderosa-pine type, ponderosa pine is favored over Douglas-fir due primarily to inherent value differences. The maintenance of high-quality value by pruning or the improvement in the quality of stands through weeding undesirable species is a key to successful marketing of timber products from a State which exports a large portion of its timber harvest to distant markets.

Losses due to wind, fire, insects, and diseases are occurring.—When major losses in a given area occur, an increased or a decreased production from the given area must be undertaken to meet the problems at hand. The most recent example of an emergency which affected many existing plants was the insect control program of logging spruce-bark-beetle-infested timber from 1952 to 1957. This caused a major reorientation in logging and marketing efforts. Another example of the same nature was the salvage program to log wind-damaged timber in 1950–51 in the Flathead and Kootenai areas.

The effect of large catastrophic fires upon existing plants must be kept in mind at all times. The origin of most timber stands in Montana dates back to some critical fire year. Although weather conditions have been good for nearly two decades, the major fire years of 1889, 1910, 1919, 1929, and 1940 are recent enough to serve as reminders that fire is still a major threat to any forest-resource-based industry when weather conditions become critical. This means that adequate fire protection is basic to areas and industries dependent upon forest resources.

As employment in the forest industries increases and communities and industries become more dependent upon forest resources, adequate fire protection will become progressively more important and must keep pace with the responsibilities placed upon it.

Two other important supply problems are those concerned with headrig overcapacity (in western Montana) and the need for access. These important subjects will be discussed under separate sections.

CONSIDERATION OF SHIFTS IN PLANT LOCATION THAT MAY OCCUR WHEN THE FOREST CHANGES IN COMPLEXION AS IT BECOMES MANAGED

The growth and diversification of wood products industry will inevitably be accompanied by significant internal shifts. Some sawmills will doubtless be forced out by the shortage of suitable timber in the localities where they operate or by cut limitations imposed by

requirements of sustained yield. It is expected that some parts of western Montana will feel supply impacts, though it is hazardous and without particular merit in this type of report to attempt to be specific. Much depends on the alertness and aggressiveness of management in adjusting to changing conditions, company resources, ownership of timber, and the extension of access roads.

Within a localized area of short timber supplies, reduced sawmill capacity may be offset by shifts to other primary or remanufactured products production, including greater use of small timber. Within the State, curtailed production one place can be sustained in another, if the adjustments to different sizes and species of raw material are made and if utilization is sufficiently good. Reference to table 13 will show that in the State as a whole, present lumber production of 940 MM b.m., which represents overproduction in some localities, can be maintained and even increased on a permanent basis.

TABLE 13.—*Estimated 1957 production compared with estimated sustainable annual production, summary table, State of Montana*

Col. 1 Type of product	Col. 2 Estimated 1957 production	Col. 3 Estimated sustainable annual production
Lumber and dimension	942 MM b.m	1,065 MM b.m.
Veneer	8 MM b.m	128 MM b.m.
Large poles (over 30 feet)	126 M pieces	450 M pieces.
Small poles (less than 30 feet)	184 M pieces	900 M pieces.
Pulpwood	27 M cords	2,218 M cords.
Fiberboard	None	360 M cords.
Fence posts	734 M pieces	6,900 M pieces.
Fuelwood	180 M cords	180 M cords.
Chemical wood	None	186 M cords.
Christmas trees	3,600 M trees	6,500 M trees.

Achievement of anything like the production levels indicated in column 3 within a reasonable time is contingent upon certain requirements being met, which it will be well to keep in mind:

1. Close utilization of all species.
2. Establishment of a variety of outlets so the varied products of the forest can be utilized to good advantage (integration of facilities).
3. Adequate fire and pest control.
4. Prompt restocking of cutover lands and other timber stand improvement measures.
5. Protection of soil and site to keep lands productive.
6. Development of access to timber (access roads) on a scale and at a rate not even closely approached.
7. Trade promotion, including study and adoption of measures effective in other States in upgrading, attracting, and holding industry.

TRANSPORTATION NEEDS FOR INTRASTATE AND INTERSTATE COMMERCE INCLUDING THE QUESTION OF FREIGHT RATES

Transportation needs for intrastate and interstate commerce involve several problems. Included here are discussions of the need for an adequate forest development road system; the intrastate forest high-

way system; the Interstate Highway System; a special problem of forest resource development; and the question of freight-rate impacts on the marketing of Montana forest products.

Forest Development Roads

It is clear that Montana has a very substantial forest development road construction job ahead. In order to harvest timber to the sustainable level of each production unit, access roads must be built in these areas soon. Main timber access roads are need for—

1. The harvesting of mature timber that should be cut to prevent serious economic losses due to insects, diseases, and fire.
2. Operations in the relatively high country, thus saving the lower and more accessible areas for winter logging and for use during periods of economic stress or urgency.
3. Realizing full value of timber stumpage because the lack of roads adds business risks and in some cases tends to restrict bidding.
4. A balance of sales-size classes for varying sizes of timber product purchasers.

Unless forest development roads are built at a rate that keeps pace with salvage, forest harvesting and management requirements, valuable timber resources will be lost to full economic use.

Montana's Forest Highway System Is Inadequate

A measure of the inadequacy is that at the current rate of progress, improvements needed during the next 10 years will take about 23 years to accomplish. This is shown in table 9, page 28, of the 1957 Report of Operations, Forest Highway System, published by the U.S. Department of Commerce, Bureau of Public Roads.

Section 3(b) of the Federal Aid Highway Act of 1958 provides that the Secretary of Commerce, in cooperation with the Secretary of Agriculture and the States, make a study of forest highways and report to Congress on or before January 1, 1960. The forest highway system consists of main and secondary highways, within and adjacent to the national forests, which serve forest development roads for hauling forest products to marketing areas. Nearly 1,200 miles of forest highways are in Montana.

Forest highways are primarily important to the States, counties, and communities. They also serve the national forests. Since most other commercial forest lands are generally near or intermingled with the national forests, an adequate forest highway system would serve the needs of most of the timber in the State. For the longer hauls within the State, there are many sections of the Federal-aid primary and secondary highway systems that are narrow, of obsolete standard, and dangerous, particularly for mixed traffic, including large log and lumber trucks.

An Interstate Highway System Will Materially Aid Marketing in Areas South of Montana

The Interstate Highway System is not contributing to the transportation of forest products from this State as fully as it should for the longer hauls to market beyond the State. Of particular importance

is the need for routes to marketing areas south of Montana. Railroad lines are oriented primarily east and west. Not well serviced by rail shipments are the areas in the growing Rocky Mountain, the Great Basin, and the southwest areas. Considerable increase in marketing outlets will be provided when these primary routes are completed.

To be considered with the Interstate System is the Columbia River Waterway which may reorient freight-cost considerations. With the early completion of Federal primary routes (present Highway 10) and the Lewis and Clark Forest Highway route, a low, competitive highway-haul cost to ports on the Columbia River at Lewiston, Idaho, Pasco, Washington, etc., may well change the marketing orientation of a considerable volume of forest products, particularly from western Montana. This, in turn, will have a directly beneficial effect on forest-product marketing from forests in eastern Montana in the demand from the Great Plains and Farm Belt areas may become intensified for products now supplied by industry in western Montana. By the same token, forest products produced in western Montana will benefit through increased values by additional marketing opportunities or reduced freight costs to markets, or both.

A Special Problem of Forest Resource Development—The Big Hole Valley

The Big Hole Valley does not have a railroad. It does have a highway that traverses the middle of the valley through the ranching areas. The main industry in the valley has been ranching. The only other local industry is that of seven small sawmills, only two of which operate more than on an intermittent basis.

The Big Hole encompasses an area of over 1 million acres. On the surrounding slopes of the valley are 670,000 acres of commercial forest land, mostly national forest. On this area is an estimated 1,200 MM b.m. of green sawtimber. Also available for use are 6,800 M cords of green trees of 5 to 11 inches d.b.h. in size; there are 3MM cords of dead salvable trees and 100,000 cords of sound material in cull trees. The large amount of dead salvage material resulted from an epidemic of mountain pine beetles that swept the area during the late 1920's. Most of the green timber left is lodgepole pine, spruce, and Douglas fir.

During the next decade or two, an annual harvest of 15,000 M b.m. of sawtimber and 110,000 cords of other products (green 5- to 11-inch d.b.h. trees) can be sustained from areas of mature timber. In addition to this, some 150,000 cords of salvage material could be cut annually. As management of the young stands is made possible, an additional 30,000 cords of material from thinnings can also be harvested.

Basically, the area needs development and construction of an industry, a railroad, and a road system to contribute more fully to the economy of Montana. The industry must be capable of utilizing not only the green sawtimber and the smaller green material in mature stands, but it must also be capable of using the salvage material available. Otherwise, logging costs and rehabilitation problems will be excessive.

The problem at hand is how to stimulate the needed actions so the area will be placed in production by a parallel development of all

three requirements, i.e., plants, roads, and railroads. Answers are not apparent now. Perhaps as demand for forest products becomes more intensified, the conditions for development will become more favorable. However, the following three questions will help bring the problem more into focus. These questions and partial answers are as follows:

1. Will the resources in the area support an industry?

The answer to this is affirmative if it is compared to other areas where railroads and industry are now in place. The resource inventory is available. Finished lumber values of $1½ million annually (15,000 M b.m. at $100 per M) are possible from the sawtimber alone; other product values (principally pulp) can exceed $18 million annually (145,000 tons, at $125 per ton). In order to produce these values an investment in plant construction would not exceed one-half this gross value. Such a ratio is not believed unduly high.

2. The resources can support a full road system.

A fully adequate access road system should be developed. This system does not have to be constructed immediately; rather it should be constructed on an annual basis in advance of, but coordinated with, timber-harvesting operations. A portion of this cost will be borne by the timber operations as part of the appraisal values. Some of the main-line roads should be constructed by appropriated funds. Net stumpage returns of $75,000 per year from sawtimber and $325,000 for pulpwood and other products will produce an annual return of $400,000 from the area.

3. What are the long-haul-freight revenues that will be produced from these resources if this area is placed in production?

Briefly, assuming that the products are produced and sold in markets outside the State, the following annual long-haul-freight revenue is apparent:

15,000 M b.m. of lumber, at $23 per M	$345, 000
145,000 tons of pulp, or other products, at $20 per ton	2, 900, 000

In other words, over $3 million of long-haul-freight revenue will be produced annually if an industry can be established. None of this revenue is now being produced.

THE RELATION OF FREIGHT RATES TO FULL USE AND DEVELOPMENT OF MONTANA'S FOREST RESOURCE

Discussion of this topic would be by far the most ambitious undertaking of this report if there were a purpose to set forth equities or inequities, or to suggest or justify changes with any degree of pretense of professional skill. To adjust freight rates may be likened to jabbing a finger at a beanbag in which the beans are economic units of the United States. Each jab creates an impact and a bulge and dislocation of all the beans. This is realized, as is the further fact that there are many professional traffic and rate experts in both private and public employ, quite capable of dealing with a freight-rate problem, once it is clearly stated. Here is the problem as it relates to full use and development of forests in Montana:

1. Montana is far from large centers of population and from markets. Montana has no monopoly of forest resources, not even one species is exclusively hers. Therefore, she must compete with products from States and regions more favorably located.

2. The competition has been hard to meet. Montana producers pay more per hundredweight to markets in the Central States than do other Rocky Mountain States. A Montana lumber producer generally pays more per hundredweight to ship any distance from 800 to 2,100 miles than does a west-coast producer shipping the same distance.

The timber is here; good timber and plenty of it; but it is not moving satisfactorily. Great areas and volumes of it are not moving at all. This is in marked contrast to the situation prevailing in all more populated regions. This helps to pinpoint the cause—distance from market, which rail transport and favorable rates can abridge. Granted there are other causes, such as costly road construction, to get timber to mills. However, access roads are being built and the case for more has been made.

The forces exist, and are working to expand production, but low and prevalent negative operating margins make expansion a slow, piecemeal process. Meanwhile great value (employment and income) and great commodity tonnage (freight revenue) are being lost currently, and forever, to tree-killing insects and disease and fire.

Attention is called to table 14 following. It shows 689,000 tons of timber products were produced in 1957. Contrast this with 2,178,600 tons estimated to be derivable from the total annual sustainable production, table 15. This is over three times the present tonnage produced.

TABLE 14.—*Estimated long-haul freight tonnages derived from production estimates,*[1] *State of Montana, 1957*

Product	Estimated 1957 production	Estimated percent shipped out of State	Total volume available for export	Estimated weight per unit	Total estimated tonnage
Lumber and dimension	942,000 M b.m	75	625,000	1 ton per M	625,000
Veneer	8,000 M b.m	100	8,000	do	8,000
Poles:					
Large	126,000 pieces	65	80,000	150 tons per M pieces	12,000
Small	184,000 pieces	50	90,000	33 tons per M pieces	3,000
Pulp	27,000 cords	100	27,000	1 ton per cord	[2] 27,000
Fence posts	734,000 pieces	30	220,000	9 tons per M pieces	2,000
Christmas trees	3,600,000	95	3,400,000	3½ tons per M trees	12,000
Total					689,000

[1] Includes all tonnages including that moved by motor freight.
[2] Exported as cordwood.

TABLE 15.—*Estimated long-haul freight tonnages derived from application of full sustainable production estimates*

Product	Estimated sustainable production	Estimated percent shipped out of State	Total volume available for export	Estimated weight per unit	Total estimated tonnage
Lumber and dimension.	1,065,000 M b.m	70	700,000	1 ton per M	700,000
Veneer	128,000 M b.m	80	100,000	do	100,000
Poles:					
Large	450,000 pieces	60	270,000	150 tons per M pieces	40,500
Small	900,000 pieces	60	540,000	33 tons per M pieces	17,800
Pulp	2,218,000 cords	75	1,670,000	2 cords per ton	835,000
Fence posts	6,900,000 pieces	60	4,140,000	9 tons per M pieces	37,300
Christmas trees	6,500,000 trees	97	6,300,000	3½ tons per M trees	22,000
Fiberboard	360,000 tons	75	240,000	None	240,000
Chemical wood	186,000 tons	30	55,000	None	186,000
Total					2,178,600

To solve the problems of salvage and timber harvesting requires access roads, favorable transportation costs to market, plus industry. Experience indicates that industry moves in where the first two conditions are favorable.

No easy solutions to the rail-transportation problems of the railroads, the timber industries, the conservation agencies, or of the consuming public are likely to be found. Perhaps closer cooperation among interested groups and mutually developed understanding could produce greater headway toward common objectives. It is to be hoped that greater progress can be made.

NEW PRODUCTS THAT CAN BE DEVELOPED FROM WOOD, INCLUDING SPECIALIZED MACHINERY FOR MANUFACTURE

Although new products can be developed from wood, of more immediate value to the State may be improvement of the products now being produced. Accordingly, discussed here will be, first, those things in which product improvement is needed; second, some of the new things that can be made from wood; following this, specialized machinery needs, including machinery for primary manufacture; pilot plants; and logging equipment.

Product improvement will gain an increase in utility and value. Some of the fields in which product improvement appears promising are:

1. Better manufactured lumber: Probably more value can be obtained in improving manufacturing processes and techniques in lumber manufacture than in any other product now produced. By applying knowledge, already available, concerning improved sawing, drying, surfacing, and handling, a very important gain can be made. Montana has a number of efficient mills. However, many of them would benefit greatly through improving practices and equipment.

2. Improved veneer-manufacturing techniques: For example, larch as a relatively new veneer species presents a number of technical problems to be solved, and sliced lodgepole-pine veneer has been produced only in limited quantities so far.

3. Strength-graded and engineered structural timbers including glued laminated products: Lamination appears to be an important part of future marketing of small timber.

4. Higher yields and grades of pulp to capitalize on the demonstrated high-quality fiber characteristics of Montana species.

Some of the new things that can be made from wood include—

1. Sandwich construction materials, in which light wood facings such as veneer are glued to corrugated or other filler material to lighten weight and increase strength.

2. Prefabricated wall and floor materials, to better capitalize on wood attributes and to permit mass production methods.

3. Polyethylene glycol-treated wood, to improve dimensional stability.

4. Modified woods and paper, to improve and vary the utility of these primary products.

5. Wood-derived chemicals, including alcohol, furfural, glycerol, etc.

One particularly promising new horizon for wood-derived chemicals will be opened when the basic components and structure of lignin are understood. Basic research is making progress and when the formula is cracked it is expected a whole new array of products can be derived fromspent pulpmill liquors.

Specialized manufacturing machinery and techniques will also improce products and reduce costs. Some suggestions are:

1. Automated primary manufacturing processes, including automated sawmills, designed to reduce costs and fully utilize small stems and residual logs and to salvage much wood now wasted. Such automation may well lead to more jobs in secondary manufacturing.

2. Cheaper and more efficient drying facilities.

3. Machines and techniques for treating resistant woods with preservatives, including Douglas-fir, larch, and spruce.

4. Better veneering machines that can yield thick veneers up to one-half inch.

5. Machines and mechanized processes to reduce costs for plywood manufacture.

6. Low water requiring and lower cost pulp and wood-fiber mills.

Pilot plants also are essential in bridging the gap between laboratory and commercial development. A now famous and successful example is the oil-shale plant at Rifle, Colo., in which techniques were developed to produce oil from shale. Two possible pilot-plant opportunities are—

1. A plant to develop methods for producing stock-feed molasses at competitive costs: The discussion on page 22 shows the benefits that might stem from economical production of this product.

2. A bark-utilization plant: Bark constitutes about 10 percent of the volume of trees. While work has been done on Douglas-fir bark in the Pacific Northwest, the uses and byproducts of this material for species other than Douglas fir have yet to be demonstrated.

Improvement of logging methods and machinery is important to increase efficiency, reduce costs, safeguard against damage to soil and water values, and to better meet forest-management needs.

Probably the point of beginning in logging improvement should be careful study and analysis of methods and techniques of logging to meet the extremely variable terrain, timber, and site requirements of Montana forests. Some suggestions are:

1. Felling and bucking equipment designed to reduce timber breakage and rehandling costs, for instance, hydraulic or pneumatic handling and grappling equipment.
2. Stump-to-landing delivery equipment for products and woods crews, including—
   (*a*) Improved jammer and other equipment for logging steep terrain—for example, suspended cable systems can be improved considerably by adapting mounted mobile power units, lightweight, readily installed suspension support towers, and rapid, safe woods-crew landing-to-site transport facilities.
   (*b*) Roll-agon equipment—i.e., the use of the low-pressure, high-flotation principle being studied by the military, to improve terrain mobility.
   (*c*) Rubber-tired and other high-speed skidding machines for use in low-volume stands on easy to moderate terrain.
3. Transportation equipment and machines, including—
   (*a*) Portable, corrosion-resistant pipelines for wood-fiber transport from the woods sites to manufacturing facilities.
   (*b*) Forest-product transports designed to provide economic hauling and to eliminate reloading and rehandling costs. Visualized are trailer units which can be spotted and loaded individually and pulled in multiple-tandem units by prime movers from the woods to plants. A requisite to this scheme is a basic design to provide exact wheel tracking so the trains can negotiate short-radius contour roads from landing to main-haul routes. Prime movers should incorporate heavy pulling and braking power for woods road work, with speedy transport, upon entry to main-haul roads to plants.
   (*c*) Lower cost and more efficient power units and fuels for heavy machines.
   (*d*) Economic aerial delivery machines for rapidly carrying crews to woods sites, and for transport of wood products therefrom.

JANUARY 22, 1959, LETTER FROM REGIONAL FORESTER TO CONGRESSMAN METCALF RE EMPLOYMENT POSSIBILITIES

U.S. Department of Agriculture,
Forest Service, Northern Region,
January 22, 1959.

Hon. Lee Metcalf,
House of Representatives.

Dear Congressman Metcalf: Reference is made to your request to express the timber-production estimates, which appear in the Montana Timber Resource Development Report, in terms of employment and income.

We have made some conversions which we think are reasonable. We find that employment conversion factors are difficult to determine because most available data are not precisely segregated to meet this need. However, the totals we have calculated are indicative and the results may be helpful in interpreting the report material.

It appears that around 8,000 man-years of employment representing wages of nearly $40 million resulted from primary production of timber products in 1957. By primary production is meant the processing necessary to convert raw material (timber) into products for the wholesale market such as dry-surfaced lumber and dimension, pulpwood or pulp, power poles, posts, Christmas trees, etc.

Secondary manufacture of timber products during 1957 apparently amounted to an additional 1,600 man-years of employment representing over $8 million in wages.

During this same period about 1,100 Federal, State, and private foresters and their employees, with wages amounting to nearly $7 million, were employed to manage the resource.

In other words, we estimate that the timber resources contributed about 10,600 man-years of employment and $56 million in the form of wages in Montana during 1957.

At full sustainable levels, if we project the same employment and wage levels as in 1957, primary production employment would increase nearly threefold—to about 24,000 man-years and $120 million. In addition to this, more foresters and employees would probably be needed to manage the timber resources of the State.

We estimate that secondary manufacture could increase more than 8 times the 1957 levels to provide about 14,000 man-years of employment representing about $80 million at present wage rates.

In other words, full use and development under the assumptions of our report might contribute 42,000 man-years and around $230 million in wages annually to the economy of Montana.

The relationships are summarized as follows:

Estimated employment and wages, timber products industry

	1957		With full use and development	
	Man-years	Wages	Man-years	Wages
		Million		*Million*
Primary production	9,000	$48	28,000	$150
Secondary manufacture	1,600	8	14,000	80
Total	10,600	56	42,000	230

Also to be considered is the employment and income afforded by businesses engaged in supplying and servicing forest products industry and its dependent communities. This is variously estimated at from 3 to 10 times that afforded by the primary industry itself.

Very sincerely yours,

CHAS. L. TEBBE,
Regional Forester.

○